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The Effects of Software-Based Peer Evaluation Structures on Student Performance in a Graduate Course Supported by Computer Conferencing

Jacques LeCavalier

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ABSTRACT

The Effects of Software-Based Peer Evaluation Structures on Student Performance in a Graduate Course Supported by Computer Conferencing

Jacques LeCavalier

An experiment was carried out to determine the effects of peer evaluation structures on the quality of student performance in a graduate course using a computer conferencing system as an adjunct medium. The evaluation structures, which were implemented as modifications to the CoSy™ conferencing system, permitted students to assign quantitative ratings (on several key dimensions) to their peers' on-line work. Students using these structures did not perform better than counterparts in the control group who used the unmodified conferencing system and were limited to evaluating their peers' work with qualitative comments. Two different mechanized feedback conditions were tested, one consisting of compiled peer ratings being displayed to only the authors of messages, and the other permitting all members of the on-line conference to see the ratings. No significant differences were found between these two treatments. Furthermore, the low quality of peer evaluations, as measured against the ratings of independent evaluators, cautions against relying on such information in CMC-supported courses. However, qualitative findings point to improvements to the study and other research directions which could result in solutions to current quality and feedback-related problems in educational computer conferencing.

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Chapter 1

Introduction and Literature Review

Computer Conferencing in Education

Research on the educational uses of asynchronous computer-mediated communication (more commonly known as computer conferencing) has been a subject of growing interest in the last several years. It has become apparent that the combination of computers, telecommunications and group interaction holds considerable potential for education at all levels. In particular, the medium has been shown to overcome many of the problems inherent in distance education which are due to insufficient dialogue and interaction among students and instructors (Kaye, 1987: Meunier & Henri, 1987; Meeks, 1987). Because computer conferencing is a means of communication which is independent of time and place, its benefits to education are necessarily more evident in situations where students are geographically dispersed. However, the potential of this "very plastic medium" (Boyd, 1986) is equally great for supporting on-campus education. In fact, computer conferencing-based educational situations may well blur the distinctions between what is and what is not considered distance education.

Some of the educational advantages described in the literature, which can apply to both distance and on-campus learning situations, include: increased motivation of students to participate in class-related interactions (Haile & Richards, 1984); greater equality of participation in

discussions (Harasim, 1987) which are also less subject to dominative influences and are more democratic (Boyd, 1987, 1986); and availability of sufficient time for students to reflect on their own and their peers' contributions to the learning activity (Kaye, 1987; Kiesler et al., 1984). Additional advantages include the convenience (for students and instructors alike) of a "classroom" which is always open and in session, the continuous and permanent record of all transactions which is stored by the host computer, and the possibility of pseudonymous or anonymous communication which can reduce inhibitions and promote greater emphasis on the quality of ideas, rather than on the status of participants (Boyd, 1986; Beckwith, 1986). Finally, Davie & Palmer (1984) suggest that the information storage and transfer capabilities of computer conferencing seem ideal for supporting educational activities at an advanced (e.g., graduate) level. These include the preparation and use of bibliographies, discussion about advanced reading materials, reading and commenting on other students' papers, and the high level of dialogue essential in graduate courses. Such is the educational context of the present study.

The Nature of Current Research

While noteworthy and important, the above conclusions have a less positive characteristic in common: they are for the most part only generally relevant to education. That is, such findings could be applied quite readily to non-educational settings where computer-mediated communication is used

for the purposes of group work or other forms of organizational communication. Indeed, most current research on the educational applications of this medium continues to take a "bird's eye" view of the problems and opportunities, mapping out only the general features of the terrain. Two approaches predominate: a) studies which compare general educational outcomes of computer conferencing-based and "traditional" (face-to-face) versions of the same course(s), and b) case studies based primarily on student perceptions of the process and impact of computer conferencing.

In the former category are found Quinn et al.'s (1983) work at the University of California, San Diego, and Hiltz' (1987) more recent and better-known work on the "virtual classroom" at the New Jersey Institute of Technology. The comparative approach to educational media research has already received extensive criticism from several authors (Salomon and Clark, 1977; Davis et al., 1981) for its inherent dangers of interpretation, and these computer conferencing studies would appear to have their fair share of confounding variables (e.g., degree of instructional planning or design required, instructor familiarity with the medium and so on). With regard to the outcome variables studied, Hiltz's (1987) approach brings to light her apparent uncertainty as to which variables and facets of the medium are really worth exploring; she touches on everything from mastery of content and level of interest in subject matter, to student attitudes towards computers.

But most importantly, what comparison studies fail to do is contribute to our knowledge of how to use the medium in question to optimize educational outcomes. Unfortunately, the second popular approach to educational computer conferencing research, case studies, has little more to offer. These attempts to assess the educational effectiveness of the medium base their conclusions on the perceptions of students and, occasionally, on rather superfluous quantitative measures of student and instructor usage (e.g., time on-line, rate of input, number of messages sent). Harasim's (1987) and McConnell's (1987) field studies at OISE and the University of Bath, respectively, are examples of this approach. This perspective also appears unlikely to shed light on the question of how to increase the educational value of computer-mediated communication. What these research efforts provide are general indications of advantages and disadvantages of the medium (as defined and used by the authors) and often conflicting subjective evidence about its actual impact on learning or performance.

More sophisticated evaluation approaches, such as those proposed by Levin et al. (1988) (participant analysis, inter-message reference analysis, message flow analysis, and message act analysis), do little to augment the value of computer conferencing case studies. A more precise measurement tool is of no help when the object of measurement (i.e., on-line student interactions) is clouded by unclear expectations of the medium and constrained by limitations in the

medium itself. Indeed, while measurements in computer conferencing research are habitually weak, the primary problem appears to be a reluctance on the part of researchers to manipulate the medium for experimental purposes. Commercial systems are still rather short on useful features and certain software modifications or perhaps innovative applications of existing features could prove useful for research purposes or to better suit actual educational uses in specific contexts. As Boyd (1990) suggests, "computer communications in education has now reached a stage of development when it is becoming important to state which of the many kinds of CMC is being used since they differentially effect learning opportunities, activities and outcomes" (p. 4). Granted, system enhancements such as software modifications can be time-consuming, expensive and limited by legal measures. Nevertheless, sophisticated measurements of educational conferencing will only become truly meaningful when the systems supporting it are themselves more sophisticated.

Better defining and manipulating these systems requires us to take heed of the "groupware" concept, introduced by Kerr & Hiltz (1982) as the combination of human and technical elements which constitute <u>structure</u> in computer-mediated communication environments. A few researchers have tried to manipulate the human environment of computer conferencing by introducing and supporting various types of educational activities in the medium, each with its own procedures and norms (McCreary & Van Duren, 1987), or by applying approaches

or techniques usually employed outside of the educational field, such as the Delphi method (Turoff, 1972) or the Nominal Group Technique (Archer, 1989). Others, outside of the educational domain, have proposed a variety of software-based structures which can modify the structure of computer-based interactions (Hiltz & Turoff, 1978; Johnson-Lenz & Johnson-Lenz, 1981). However, the literature remains mostly silent with respect to experimentation with software-based structuring in educational contexts.

A legitimate question arises as to why it would be necessary or even desirable to experiment with structural manipulations of educational computer conferencing, and more specifically with software modifications. The answer to this question, and thus the rationale for the present study, is in three parts. First, there are indications of problems with the quality of "educational" computer conferencing interactions as a whole. Second, it appears that these problems are largely due to the feedback characteristics of the medium, an aspect which is eminently subject to manipulation. Third, the medium is typically quite demanding of instructor and students in terms of time and attention, but it also has significant information storage and transfer capabilities, so the bulk of the required structural manipulations should be carried out in the software domain so as to avoid placing further demands on the human actors.

Quality Problems in Educational Computer Conferencing

Anyone familiar with a popular computer conferencing system (such as the University of Guelph's CoSy installation) can attest to the often disappointing quality of interactions which take place in the many conferences set up by members. Poor moderation, discussions lacking a focus, and a virtual sea of unanswered questions and unacknowledged comments reflect the current state of a still underutilized medium. In the realm of educational conferencing, quality problems also exist. Describing the Open University's experience with computer conferencing-supported distance courses, Mason (1987) asserts that "much of what one reads on actual conferences falls far short of real intellectual exchange. The phenomenon of "overload" is not so much a problem of too many good ideas as of too much rubbish!" (p. 37). In support of the suggestion made earlier that the medium requires structural manipulations to be effective, she adds that "using the technology doesn't mean it is being well used. In other words, communicating isn't necessarily educational".

Other authors report similar shortcomings of the medium, with respect to quality. McConnell (1987), for instance, finds that students themselves are satisfied with the process dimensions of learning supported by computer conferencing, but dissatisfied with the educational outcomes. Henri (1989) found that only a small percentage of user interactions in an on-line training context reflected anything resembling "deep" processing of information. Kaye's (1987) interpretation of

the problem is that the medium "provides opportunities for students who have wrong or misconceived notions about the subject-matter of a course to propagate these notions at the flick of a switch, and thus mislead others in the group" (p. 31). In fairness, there are those who attest to better quality of student work in computer conferences. For example, Roberts (1988) reports that the written work of students in a CMC-supported class appeared to be superior, but adds that "the students who elected to take the pilot may be a select group from which superior performance would be expected in any case" (p. 36).

Feedback Control: A Weak Link in Educational Conferencing

In large part, the quality-related failings of educational computer conferencing appear to converge on one critical aspect: the feedback characteristics of the medium. While not proposing ways to overcome the problem, Hiltz (1986) does recognize that the absence of immediate feedback (which is regularly experienced in face-to-face communication), is a problem which limits the effectiveness of asynchronous computer conferencing. (It should be noted that the notion of feedback used here is distinct from its more strict cybernetic definition, used by Boyd (1981) and others, which implies that replying to the sender of a message - i.e., a return loop - only constitutes feedback if the return message changes the future behaviour of the system, of which the sender is a part. This requires not only that messages be

fed back to participants, but also the presence of agreed-upon standards for comparison with actual performance).

On a similar vein, Mason (1988) calls attention to the problem of "diminished obligation to communicate" which exists in computer conferencing. With no one looking at you in the face with a question, expecting an immediate response, it becomes very easy indeed to "lurk" in computer conferences, reading messages but only rarely contributing anything yourself. Such is the comparative disadvantage which the sender of information has with this medium, where physical and temporal separation reduce the perceived responsibility to respond on the part of the receiver. The result is that the quality and/or the quantity of the sender's future participation may be affected: "in the computer conference, we wonder if anyone has read our note, and if so, how did they receive it? Without feedback our fears are magnified, and we become resistant to continuing our contribution" (Davie, 1988, p. 8). Or we may simply come to expect that others won't respond at all: "responses by... students sometimes resemble monologues, rather than discussion. Since conferencing is asynchronous, entry can be its own immediate, unchallenged reward" (Roberts, 1988). Indeed, CMC requires of students to "discipline themselves as regards their participation", something which is not required with most other media in distance education (Henri, 1988).

Kiesler et al. (1984) observed some anticipatory effects of this problem on participants interacting on-line:

"the usual forms of discussion control through back-channel communications could not be exerted. People did not know exactly when their arguments were understood or agreed to, and consequently everyone believed they had to exert more effort to be understood" (p. 1130). One of the conclusions reached by these authors is that computer-mediated communication is subject to an overall weakening of self- or normative regulation. While this is surely due in part to the physical and temporal separation noted earlier, such weakening of regulation has long been thought to be a problem in group communication in general, a phenomenon dubbed "groupthink" by Janis (1972) and defined as the deterioration of mental efficiency, reality testing and judgment that often results from in-group pressures. Considering the regulatory demands inherent in the learning and applying of new and often difficult material (the present study was conducted in a graduate class in educational cybernetics, a subject area most unfamiliar to the majority of students entering the course), these feedback-related problems of on-line communication are very significant. Furthermore, if we consider as important the establishment of positive conditions for learning through this medium, which would foster "a willingness to take risks, to accept correction and to respond to others critically" (Mason, 1987, p. 38), then clearly the feedback capacities of computer conferencing require some improvement. Only then will its many educational advantages,

outlined at the beginning of this discussion, have the potential to be fully exploited.

Feedback in Education

The importance of well-structured feedback in educational computer conferencing is but an amplified case of the situation in education as a whole. Whether considered from the perspective of cybernetics, or in the more conventional contexts of student evaluation, it is reasonable to expect that having access to information on one's own and/or peers' prior performance will help to improve future performance. This would be consistent with the claims of theorists who argue that feedback serves an informational function rather than a reinforcement role (Bardwell, 1981). Slavin (1978) complicates the issue somewhat by suggesting that informational feedback "tells students where they stand in comparison to other students" and thus should be norm-referenced, while performance feedback, which acts as a reinforcer and enables students to adust their level of performance to meet their goals, should be criterion-referenced and given very close in time to the performance itself. The use of such terms appears to be subject to interpretation (e.g., Does a criterion-referenced measure become norm-referenced when results are made public? What prevents a student from perceiving informational feedback as performance feedback, regardless of the instructor's intention?). For purposes of this study, it is difficult to imagine how the information

derived from feedback could relate to anything else besides performance, so the distinction will simply not be made.

McClintock & Van Avermaet's (1975) findings in a study carried out with children suggest that feedback on own and others' performance produces a higher state of arousal and hence superior performance than feedback on one's own performance only, and that in turn this latter condition leads to higher levels of performance than no feedback at all. The results were thought to be consistent with the assumption in Festinger's (1954) social comparison theory that two processes are at work in motivating higher performance: a unidirectional drive to do better, and a need to reduce discrepancies between own and other's performance. These authors also found that the "relative strength of competitive motives as reflected in performance was greater for older than younger children" (p. 114), suggesting by extrapolation that such competitive motives may be even more significant for adults.

In a study investigating the effects of self-regulation (defined as consisting of self-monitoring, self-evaluation, and self-reinforcement) on skill development and percepts of self-efficacy, Schunk (1982) found that both students monitoring themselves and those being monitored by another person significantly outperformed those in the no-monitoring condition. The author interprets these results as follows:

> Explicit monitoring of performance provides a reliable guide to progress and helps validate percepts of efficacy.

> A strong sense of efficacy for being able to perform cognitive tasks should sustain subsequent task involvement and promote achievement....If self-monitoring derives its effectiveness largely from covert self-evaluative processes, then the monitoring agent may be less important than the monitoring itself since self-evaluation could conceivably occur as a result of monitoring by others (p. 90).

Van Houten (1980) advises that to be effective, feedback should be precise (i.e., quantitative), preferably immediate and frequent: "ideally, a student should receive feedback from each and every performance when acquiring proficiency with new material" (p. 58). As Holmberg (1981) suggests, such feedback is not possible in a distance education context with conventional methods: "an evident weakness in normal distance study is the delayed feedback given in tutor comments, whether direct and personal or computerized. Only by telecommunication is immediate feedback in distant two-way communication possible...Completion rates have been shown to correlate with turn-around time" (p. 89). With regard to feedback being quantitative, Slavin (1978) reminds us that numbers are perhaps more motivating than we like to think: "the substantially lower performance seen in university courses that use pass-fail grading supports this assumption: grades do motivate" (p. 97).

Van Houten cites an experiment which found that peer evaluation improved the performance of both tutor and tutee

(i.e., the act of evaluation impacting on content learning), and claims that public posting of ratings works in part by providing individuals with social norms (in junior high study, performance improved more for students receiving feedback on their own AND on others' performance). This is consistent with the findings of McClintock and Van Avermaet (1975) cited earlier and provides ample support for experimentation with vaying levels of public or private evaluation structures in computer conferencing.

Of particular interest to the "virtual classroom" context of educational computer conferencing is a study by Hannafin (1983) which demonstrated the significant impact of systematized (as opposed to informal) feedback in a "natural" classroom setting. The author asserts that "feedback is of significant value when applied in a structured, systematic manner" and that "a more methodical approach to providing feedback as an essential element of an instructional system in natural settings is both feasible and effective" (p. 27).

It should be noted that much of the literature on instructional feedback is only partially relevant to the present study, where the subjects are adults engaged in a long-term complex task which involves some learning of new material but primarily the application of previously learned concepts and principles to a familiar situation. Most research on feedback in education has involved children engaged in fairly simple and short-term learning tasks. Considerable caution must therefore be exercised when applying the

findings of this prior research, with respect to the frequency, timing, source and other aspects of feedback, to the context of the present study.

In addition to contributing to improved performance on educational tasks, provision of feedback via peer evaluation also has the potential to help students develop a very important skill which is not often targeted explictly by educational interventions, even at the graduate level. The literature on metacognition confirms the importance of monitoring and evaluation stragegies in learning (Baird & White,1984; Gilbert, 1986; Schunk, 1982; Nickerson et al., 1985), and the prominence of evaluation-related skills and attitudes in the domain of critical thinking is also well documented by Ennis (1985), Sternberg (1987) and Pooker (1984) ("the habit of objectively evaluating one's own and others' thoughts and arguments").

Requiring students to monitor each other is an approach which utilizes the apparent benefits of social interaction in the development of metacognitive skills (Reeve & Brown, 1984), and which has the practical benefit of allowing the instructor to devote more time to other matters (Schunk, 1982). It is an accepted fact that the moderator in a computer conference (i.e., in most cases, the instructor) "is by far the hardest working of all the conferees" (Stix, 1987, p. 114), and furthermore that "the better able the moderator to elicit judgments from all members of the conferencing group relative to both the problem at hand and the contributions of

the others, the more effective the group" (p. 111). Ellis & McCreary (1985) agree that without a strong moderator a conference can easily descend into trivia or run out of ideas. In an educational computer conference, the provision of informational and corrective feedback becomes an added responsibility not present in most other contexts. Well-structured peer evaluation could allow the partial transfer of this responsibility to student participants, an approach to which Van Houten (1980) gives his support: "the only way that a teacher can practically provide immediate feedback to a large class of 20 to 30 pupils is to involve the students in the scoring process" (p. 57). In a study carried out with college ESL students, Chaudron (1983) found that peer and teacher evaluations were equally effective in promoting improvements in student compositions. The author therefore recommends the use of peer feedback because of its potential benefits as a saver of teacher editorial time. Beaven (1977) makes a similar claim that peer groups can provide more immediate feedback than the instructor, and cites an experiment in which a peer evaluation group outperformed a control group on measures of organization, critical thinking and sentence revision.

Computer-Mediated Evaluation and Monitoring

Harasim (1987) argues that "the nature of the interaction cannot be measured by quantity of output alone. Other, qualitative analytical units need also to be taken into consideration in analyzing on-line educational interactions"

(p. 180). In her case, however, this qualitative analysis is restricted to the presentation and interpretation of typical student comments and reactions. It fails to address the need, seemingly so vital in educational applications, to find (possibly quantitative!) ways to analyse the quality of student contributions and interaction.

Such approaches are to be found primarily outside of the educational literature, and largely within the realm of computer-supported cooperative work (Greif, 1988). Probably the most sophisticated, albeit only partially tested, example is Stodolsky's (1984) computer-mediated dialog management system, whereby measurement of individual performance in dialog is achieved through system monitoring of criticism (was it initiated, was it sustained or overturned, and so on), and Bayesian estimation of the probability of correct criticism. The rationale underlying the system, certainly applicable in educational contexts, is that "effective dialog requires responsible criticism to insure that deliberatory procedures are followed and more generally to enable the rapid correction of errors so that time can be spent constructively" (p. 1). Moreover, the criticism exchanged by participants constitutes a "meta-dialogue" which is explicitly operationalized to compensate for the lack of an implicit channel of communication in computer-mediated interaction.

Simpler methods for evaluating or monitoring computer-mediated interactions also exist. A decade ago, Hiltz &

Turoff (1978) were already proposing enhancements to computer conferencing which would potentially improve the quality of group decisions by balancing "qualitative discussions of complex problems with quantitative information summarizing individual and group judgments" (p. 273). Actual features making possible the quantitative rankings of messages and the collection of results were implemented in the TOPICS system, an offshoot of EIES (Electronic Information Exchange System) (Johnson-Lenz & Johnson-Lenz, 1981). Spangler et al. (1978) also experimented with a software-based "interactive monitor" which would provide for evaluation of group and individual performance for groups working on complex tasks, but results of the experimentation were apparently not published.

In a descriptive study, Hammond (1977) found that quantitative, pictorial communication of judgments was effective for interpersonal learning and conflict reduction in a regional policy exercise. The improvement of group acquisition and transfer of knowledge is also the objective behind the PCS (Participant Construct System) and KITTEN systems (Shaw, 1987; Shaw & Chang, 1986) which make use of graphical scales based on personal constructs to "allow members of a community to explore their agreement and understanding with other members, and to make overt the knowledge network involved" (p.198). Another system developed at Xerox to support face-to-face meetings (Stefik et al., 1987) integrates sophisticated hardware with software tools for proposing,

arguing for, and evaluating proposals. Evaluation criteria are developed during the course of the process.

In sum, evaluation and monitoring of performance or progress are feasible to implement in a CMC environment and potentially very effective. However, this has yet to be experimented with to any significant degree in educational contexts. Aside from addressing the evaluation and feedback-related shortcomings of the medium, the implementation of evaluation structures also makes effective use of the previously outlined advantages of CMC: 1) the continuous written record provides excellent material for highly desirable continuous evaluation of the thinking done by students (Baron, 1986); 2) the time which students have to reflect while communicating asynchronously can be spent more constructively than it might be without such structures; 3) students are evaluated only after they have placed their contributions in the conference (again because of the asynchronous nature of communication), avoiding the distracting effect of simultaneous evaluation (Stodolsky, 1979); and 4) anonymity in quantitative evaluations (with or without pseudonymous comments) allows students to overcome resistance to evaluation by others, which Reeve & Brown (1984) describe as a formidable barrier to learning. On this last point, however, others have found considerably less resistance to on-line evaluation than expected: "apparently, there was little need felt to explain, apologize for, or joke away

inadequacies of substance in one's contributions...this was surprising to us" (Stix, 1987, p. 112).

Problem statement

The primary focus of the study can be summarized as follows: What are the effects of software-based peer evaluation structures on student performance and attitudes in a graduate course delivered with the aid of a given configuration of computer conferencing?

Additional data will be collected in order to assess other dimensions (besides effects on student performance) of the worth of the peer evaluation features. Specifically, an attempt will be made to answer the following questions:

1. Under the given instructional conditions, do the quantitative evaluations of students in fact discriminate between their peers' low- or high-quality contributions? (Put in other terms, can the instructor rely on students to make reliable evaluations?)

2. Does information on one's own and on the performance of peers lead to greater gains in future performance?

Hypotheses

H1: Due to the presence of evaluative feedback, the quality of student contributions in both the experimental groups will improve significantly more over time than will the quality of student work in the control group.

H2: Due to the enhanced feedback available to the second experimental group (feedback on own and others' performance), the performance of this group over time will be superior to

that of the first experimental group (feedback on own performance only).

H3: The quality of peer evaluations will improve significantly over time and due to the transparence of evaluative information, the quality and consistency of student evaluations will be greater in experimental group 2 than in experimental group 1.

Chapter 2

Method

Operational Definitions of Variables and Parameters

Student performance is defined here as the quality of student work in an eight-week cybernetic modeling project carried out wholly on-line. The contributions specifically consist of responses to a detailed series of questions contained in a five-phase project outline provided by the instructor (see Appendix A). Detailed descriptions of these conferences and of the tasks involved are provided in a later section.

The quality of contributions was measured on the basis of three dimensions of excellence adapted in part from Powers' (1986) multi-dimensional assessment scheme. The following definitions are reproduced verbatim from the instructions given to students (see Appendix B).

1. Depth: refers to the depth of knowledge demonstrated about the system component being described or analyzed and, if the question requires it, about cybernetic ideas, concepts or principles. Also refers to the depth of analysis of other people's work.

2. Organization: refers to the structure of an answer or of a comment. It should be easy to follow and logically organized.

3. Creativity: refers to the originality of the ideas expressed in answers or comments, and to other creative abilities demonstrated (drawing analogies, looking at some-

thing from a different perspective, combining things to create something new, and so on).

More than any other dimension, depth measures the amount of thinking which a student has done about the subject of his contribution. Considering that the software-supported evaluation features are largely intended to encourage students to reflect more deeply about their own and others' contributions, this is a critical dimension indeed. Of the three dimensions, depth also relates most closely to the content of the course (i.e., addresses the need for students to apply cybernetic concepts and principles correctly), while still allowing for the initial phase of project work during which students primarily discuss the educational systems they have chosen to analyze, with very little direct reference to educational cybernetics.

Organization, like depth and creativity, measures in part the amount of care taken by students to produce work of high quality. More specifically, this dimension quantifies the perceived effort students make to ensure that they are understood; it also addresses the degree of attention paid to the other members of the group, reflecting a positive response to sufficient and appropriate feedback, or the opposite (Powers, 1986). Initially, the dimension of clarity had been selected, but it was subsequently replaced by organization because it was felt that the latter put more emphasis on the overall structure of student contributions and therefore less emphasis on the quality of language, a

source of difficulty and a disadvantage for students with a mother tongue other than English (which was the case for six students participating in the study).

The dimension of creativity completes the three-tiered definition of quality; here the focus is on finding evidence of students going beyond what is minimally required, and taking the time to examine and reflect on alternative perspectives on their own work and that of their peers.

For each of the dimensions, a ten-point scale was used with "10" being the highest rating and "1" the lowest. It was believed that this resolution would allow reasonably quick evaluations by students and still discriminate sufficiently between the various levels of quality in student performance.

Student attitudes are defined as those attitudes which relate directly to the usefulness and appropriateness of the software-supported evaluation structures, as well as to the particular conditions of feedback and evaluation found in educational environments supported by computer conferencing. These were measured after completion of the instructional tasks, with the help of an attitude instrument developed for this study (see Appendix C). Specific attitudes measured included: (a) perceived quality and impact of the feedback and evaluation received by students from various sources; (b) student perceptions of the degree of effort put in by themselves and by their peers during the assigned task; and (c) perceptions of the worth of the peer evaluation structures, considering any quality-related benefits as well as the

effort required to carry out the evaluations (for the experimental groups only). More general attitudes concerning the use of computer conferencing in ETEC 606 and in other educational contexts were also targeted by the instrument (e.g., perceived impact of the medium on the quality of the learning experience, quality of training and technical support provided, appropriateness of the time requirements of computer conferencing).

Student comments about the peer evaluation structures (or related aspects of the task), whether made face-to-face, during the end-of-course debriefing (which was recorded and transcribed) or finally on-line in conferences intended for that purpose, were also collected and used as qualitative evidence.

Finally, the performance of students as evaluators was also the object of measurement. This being an important and useful skill for students to acquire, the author wished to determine if the quality of their evaluations (measured in relation to the evaluations of the independent experts) improved over the course of the eight-week experimental period.

Sample

The sample for the study consisted of 15 adult students (10 females and 5 males) enrolled in the Fall 1989 section of ETEC 606, a required Educational Cybernetics course in Concordia University's Graduate Programme in Educational Technology. Initially, 21 students were assigned to three

groups of equal size for purposes of the study, but three of these students dropped out of the course before taking part in the computer conferencing activities. Two other students suspended their on-line activities soon after beginning, one because of other course commitments and the other for medical reasons, and another student got started when six weeks of the 8-week experimental period had already expired. This mortality resulted in data being collected from two groups of 4 students each and one group of 7.

A questionnaire administered about two months after the end of the course provided the following additional information about the subjects: (a) the students were distributed evenly in three categories pertaining to the previous use of microcomputers (one third had never used them, one third had used them occasionally, and one third had used them frequently); (b) all but two students judged their typing skills to be at least "casual but good enough" (or 3 on a scale of 1 to 5); (c) slightly more than half of the subjects had their own equipment at home with which to access the computer conferencing system; and d) about one half of the students expressed that they had been "anxious" at the beginning of the course regarding the prospect of using computer conferencing (one third were "excited" and the others were either "indifferent" or simply "at ease" with the idea).

Three of the 15 active participants had significant difficulties with written English. For two of them, this resulted in more time being taken to enter a lower quantity

of contributions on-line and some reports of trouble understanding some comments of peers and instructors. The third, who was francophone, chose to carry out her on-line work in French, after first getting agreement from instructors and the members of her group (all but one of them were able to understand and comment on her work without undue difficulty).

Research Design

The research design for the central question of this study consisted of a three-group repeated-measures experimental control group design (or a three-by-four mixed factorial design), which can be represented in the following way, using Campbell & Stanley's (1963) notation:

R	X_1	O_1	O_2	O_3	O_4
R	X_2	O_5	O_6	O_7	O_8
R		O_9	O_{10}	O_{11}	O_{12}

The observations represent mean ratings of the quality of student contributions in a computer conference, along each of the three dimensions already described, compiled over four two-week periods. In short, the design permits measurement of student performance over time.

Experimental Treatments

The subjects were randomly assigned to the three following groups:

1. Control group (BETA - conference "betabits"): Students in this group used the CoSy conferencing system "as

is" and did not have access to the peer evaluation features (which are described in detail in a later section). Students were nevertheless instructed to keep in mind the three dimensions of quality noted previously, when composing their own contributions and making comments on those of others (for the full text of the instructions given to the subjects in each group, see Appendix B).

2. Experimental group 1 (ALPHA - conference "alpha-bits"): Students in this group used the software-based evaluation features. The implementation of the features was somewhat limited for this group, in that once a message was evaluated quantitatively via the "evaluate" command, only the author of that message could see the compiled results of the evaluation. In other words, while students evaluated each other's messages, they only had access to compiled evaluation results for their own messages and they were not able to compare their evaluations (both "incoming" and "outgoing") with those of their peers.

3. Experimental group 2 (GAMMA - conference "gamma-rays"): In this group, the evaluation features were more fully used. The compiled results of all message evaluations could be seen by all conference participants, not just the authors of evaluated messages. If they wished, students could therefore compare the ratings of their contributions with those of other students, as well as verify how close to the norm their outgoing evaluations were.

Evaluations carried out via the software features were anonymous, in that rankings were automatically compiled and averaged by the software, and never associated with any student ID. In an attempt to compensate for this partial use of anonymity in the experimental groups, the members of the control group were provided with instructions and the means for using pseudonyms (e.g., "red", "blue", etc.) when making evaluative comments on the contributions of their peers. However, only one student made use of this option, and this more by error than by intention.

Materials and Media

The computer conferencing system used for this study was CoSy™ (VMS version, Release 3.0), the popular conferencing software developed at the University of Guelph and now distributed by Softwords Inc. of Victoria.

CoSy was selected because of the familiarity of the research team with the system (the author and his supervisor had experimented with CoSy in various contexts since 1986), and because of certain inherent characteristics important to the present research context. These included CoSy's relative ease of learning for new users (important considering the short timeframe of the study), its file transfer capabilities (essential since students were expected to compose and review many messages off-line), and the possibility of making software modifications (the terms of the software purchase agreement included access to the source code).

Two other software packages supporting the use of CoSy were provided to students at the beginning of the course, along with the required documentation: a) Procomm™, a "shareware" communications package developed by Datastorm Technologies Inc., which managed the interface between the microcomputers used by students and the host computer at Concordia University on which CoSy resides; and b) C.U.T.E. (Concordia University Text Editor, originally developed as SLED by Sam Wilmott), a compact yet quite powerful text editor which was used by students to compose work off-line and which supplemented CoSy's rudimentary line editor.

For the benefit of students who did not have their own equipment to use, arrangements were made to provide access to microcomputers in two locations on the Concordia campus. Two microcomputers with modems and dedicated phone lines were made available on a priority basis in the ET Annex, where Educational Technology graduate students have their study space, and access was provided to a microcomputer laboratory elsewhere on campus which was linked via PACX connections to the CoSy host computer.

Computer Conferencing Environment

General aspects. ETEC 606 was an on-campus course with classroom lectures given every week. Computer conferencing was used as an adjunct medium, not as the primary means of delivery. It was therefore possible to focus its use quite precisely and avoid the difficulties which could have been caused by introducing the medium into all aspects of the

course. For example, students were not required to learn and use the electronic mail functions of CoSy (used for private messages between users), since private discussions among students, instructor and tutor could easily be arranged and carried out face to face. In fact, the use of private mail functions is not really desirable in educational conferencing, as it short-circuits the group conferences, thereby weakening them to some degree.

Moreover, the conferencing system was not intended to be used for the presentation of course content or for general discussion about it; the lectures and classroom sessions had this purpose. CoSy was used almost exclusively in the context of a major assignment which required students to apply the concepts and principles of educational cybernetics to an educational system with which they were familiar. This cybernetic modeling project is described in more detail below.

In order to create a structured environment where students could both present their project content in their own project "space" as well as benefit from the input of their peers, each student was assigned his/her own conference topic, its name corresponding to the topic of the student's project (e.g., *blacc* for Banff Leadership and Challenge Course). All contributions pertaining to this project, whether originating from the student responsible, peers or instructors, were required to be added as messages or comments to the assigned topic. For both practical and experimental purposes, three project conferences were created,

each with seven project topics and seven student members (as mentioned previously, the initial sample consisted of 21 students registered for the course). These conferences were created as closed conferences in CoSy, meaning that access was restricted to members (only the moderator - the person creating and maintaining the conference - could add new members). The project conferences had simple differentiating names, slightly embellished at the request of participating students (*alphabits, betabits* and *gammarays*). Appendix E contains excerpts from these conferences.

A number of other more "peripheral" conferences were also accessible to students; these were intended to fulfill information and communication requirements not related to the project assignment, and included: a) conference *learn*, which comes with the CoSy software itself and constitutes a rudimentary tutorial on basic commands and procedures for new users; b) conference *refs* (with topics *articles* and *books*), which provided lists of references potentially useful to students (students were also invited to add references which they thought relevant); c) conference *pub90* , an informal "students-only" space for discussion about anything not related to the course (also used for electronic release of course- or CoSy-related frustrations); d) conferences *projinfo1, projinfo2, projinfo3,* which were opened just prior to the beginning of on-line project work and included the group-specific instructions contained in Appendix B and discussed later in this chapter; and e) *bibs* (with several

topics corresponding to sub-domains of educational cybernetics), a conference from the prior section of ETEC 606 containing student "inter-bibliography" entries (each student had been required to input summaries and critiques of ten articles from the field).

The size of the groups making up the membership of each project conference was based on the recommendations of other researchers, including Stix (1987) who found that instructional conferences with six or seven members usually had sufficient activity to keep everyone interested, without making it too difficult for students to keep up with the flow of contributions.

Peer evaluation structures. The integration of peer evaluation capabilities into CoSy required considerable software modifications. Once the specifications had been worked out by the author in consultation with other members of the research team, the modifications were carried out over approximately a one-year period by Dimitri Kourkopoulos, a research assistant with expertise in C language programming in a VMS environment (a detailed account of the planning and execution of the software modifications is provided in Appendix D). The general functional specifications for these new features were the following:

1. The availability of the peer evaluation features would be restricted on three levels. The instructor or moderator would be able to decide for which users, topics and conferences the features should be available.

2. The flagging of messages as either "evaluated" or "unevaluated" would be similar to the flagging of messages as either "read" or "unread". More specifically, the number of both unread and unevaluated messages would appear on each user's conference list at log-on and CoSy would only consider a message to have been "read" if it also had been evaluated (see further details in "4" below).

3. In terms of activation, the evaluation procedure would not be initiated automatically at the end of message, but would rather require the user to issue a typed command. This would allow the user to perform one of several alternative actions before evaluating a message, such as displaying the message again or abstaining from evaluation. The inclusion of the abstention option was intended to apply primarily to messages which could not "reasonably" be evaluated (e.g., very short messages, instructions or administrative comments, etc.).

4. Notwithstanding the option to abstain, message evaluations would be coercive in that users would not be permitted to display a new message until the previous one had been evaluated. The aim of this approach was to ensure that students would keep up with message evaluations and not let unevaluated messages pile up. The issue of "forced" versus optional message evaluations was the object of considerable debate among members of the research group. This is covered in more detail in the Discussion section.

5. In spite of the partially coercive approach to evaluation, it would be possible for users to file all new messages for later downloading to disk without first evaluating the current message. This would encourage students to reflect upon their peers' contributions before actually rating them on-line.

6. Evaluations would be anonymous in that all ratings would first be compiled and averaged before being displayed to the author of a message.

7. Evaluations would be partially blind in that evaluators would only see the compiled evaluations after having entered their own ratings. An option available to the moderator would make the evaluations totally blind by removing the ID of the author from the header of the message to be rated. A second option would display compiled evaluations for each user's own messages only, thus further altering the conditions of feedback.

8. In order to facilitate data collection, the following evaluation data would be compiled for each message and made available to the moderator via a "report" command: frequency distribution for each dimension used in the evaluation; mean; and standard deviation.

The following sample dialogue illustrates how the evaluation features operated in the context of the "gammarays" student project conference (readers will recall that the experimental treatment used in this conference/

group included the provision of feedback on evaluations to all members):

```
(STUDENT INPUT SEQUENCES ARE IN BOLD CHARACTERS - <CR> = RETURN)

Read: join gammarays <CR>

Topics are 'cbo', 'cree', 'docu', 'food', 'newtech',
'production', 'tv' (PROJECT TOPICS)

Topic? cree <CR>

===> 'gammarays' is an EVAL conference.

Joining conference 'gammarays', topic 'cree'.
There are 2 unread and 2 unevaluated message(s) of 7.

Read-eval: <CR>

(BY DEFAULT, CoSy DISPLAYS THE NEXT UNREAD MESSAGE)

=============
gammarays/cree #6, student1, 302 chars, 14-Oct-89 13:25
There is/are comment(s) on this message.
-------------

TITLE: 2.5 OTHER PRINCIPAL ACTORS IN MY SYSTEM
Cree students; ...Other students in the class (14); ...Learning
skills coordinator
(...)

Eval/action: help <CR>

-----------------------------------------------------------------
EVAL  Action
-----------------------------------------------------------------
Choose one of the following responses:
   Abstain        Abstain from the evaluation; message evaluated.
   Eval           Evaluate the message.
   Help           Display this information.
   Read           Display the message again.
   Quit           Go back to EVAL-Read: prompt; msg not evaluated.
-----------------------------------------------------------------

Eval/action: eval <CR>

--> Please evaluate the message on the following dimensions.

Dimension         Range     Evaluation     (SHORT DESCRIPTIONS OF
depth             1 - 10      --> 6 <CR>  THE DIMENSIONS ARE
organization      1 - 10      --> 7 <CR>  DISPLAYED IF THE USER
creativity        1 - 10      --> 5 <CR>  TYPES A "?" INSTEAD OF
                                          A NUMBER)
Eval add/action: add <CR>

Read-eval: header 6 <CR>
```

```
============
gammarays/cree #6, student1, 302 chars, 14-Oct-89 13:25
There is/are comment(s) on this message.
-------------------------
=========================================================================
EVALUATIONS on #6, as of 17-Oct-89 16:10.      5 evaluation(s)
depth: 7.4;       organization: 7.4;          creativity: 6.6;
=========================================================================
TITLE: 2.5 OTHER PRINCIPAL ACTORS

Read-eval: <CR> (STUDENT ACCESSES NEXT UNREAD/UNEVALUATED MSG.)

==========================
gammarays/cree #7, student2, 298 chars, 14-Oct-89 13:37
This is a comment to message 6
-------------------------

Suzanne, while the success of your project depends on
your hard work and dedication as a team ,
(...)
```

Procedures

Training of users. Based on the author's previous experience with earlier offerings of CoSy-supported ETEC 606 and the recommendations of other researchers (McConnell, 1987; McCreary & Van Duren, 1987), subjects were provided with as much technical training and support as possible. This consisted of half-day group workshops given by the author and an assistant during the second week of the course (in which all but one student participated), specially developed documentation on the three software packages used, access to technical help and moral support for the duration of the course (on-line or via telephone) and individual training sessions when necessary.

The user training materials and procedures were pilot-tested during the Winter 1989 section of ETEC 606, when CoSy was used as an adjunct medium, but without evaluation structures. This prior experience and the comments of students

involved in it led to significant revisions and improvements being made to training approaches and materials.

Instructional tasks. As previously mentioned, ETEC 606 was given as on-campus, lecture-oriented course with computer conferencing used as an adjunct medium. Weekly lectures covered in various ways the fundamental concepts and principles of educational cybernetics and provided students with opportunities to ask questions of the instructor and discuss various aspects of the content with their peers.

In the previous offering of the same course (which also used computer conferencing as an adjunct medium), CoSy-supported instructional tasks included on-line reviews by students of articles read in the early weeks of the course (Prof. Boyd appropriately called this an "inter-bibliography" assignment). This exercise was followed by a mid-term examination of three weeks' duration which required students to answer three essay-type questions on-line and comment on the answers of their peers (students were divided into groups of manageable size for this purpose). This approach was later judged to be unsatisfactory because of major drawbacks in each of the two instructional tasks described. First, the inputting of on-line reviews, while serving a useful purpose in terms of information exchange, did not encourage active discussion among students and so did not take advantage of the most fundamental advantage of the medium. Secondly, the mid-term exam period was found to be far too short; the students who strove to enter their answers to the mid-term

questions early in each one-week period were in effect penalized, since many of their peers delayed adding their responses until the end of the week, thereby making it quite difficult for the "early birds" to find something to comment on! So again, interaction among students was not facilitated.

In addition to the on-line activities, this previous section of the course also included: a) a major project which required students to apply cybernetic principles and modeling approaches to the analysis of an educational system familiar to them, and b) a class presentation on one of the course topics. Perhaps not surprisingly, students commented at the end of the course that the workload had been excessive, and this largely as a result of the additional effort required to learn and use CoSy, an unfamiliar information-intensive medium.

Based on these experiences, the number of instructional tasks was reduced considerably in this second "experimental" offering of the course (once we realized that software modifications would not be ready for the Winter section, it began to be called the "pre-experimentation" phase of the project!). It was decided that in order to gain maximum benefit from the educational use of computer conferencing, a) it would need to be used for a longer period of time during the course, b) it would be necessary to design a well-structured task which would truly benefit from and encourage student interaction, and c) workload pressure from additional instructional tasks would need to be minimized or eliminated

altogether. The structure of the Fall section of the course reflected these changes, with the focus becoming the on-line completion of the cybernetic modeling project, in a group context.

Cybernetic modeling project. This project assignment has been used (and revised) for many years by Prof. Gary Boyd, the faculty member responsible for ETEC 606, as a means of encouraging the transfer of newly acquired knowledge about cybernetics to real-world "messy" problems in the training and education domains. It requires students to characterize, analyse, diagnose and propose improvements to an actual educational or training system, in a structured and ordered way and using concepts and principles from the field of cybernetics and related disciplines. Previously, the project was carried out individually by students, with few opportunities for feedback about progress before final submission, and no opportunity for exchange of ideas and criticisms among students. Because of this less-than-ideal context, as well as the considerable scope and difficulty of the project assignment (cybernetic concepts are difficult for some students to grasp completely, and even more so to apply), it was thought to be an instructional task very well suited to being carried out via computer conferencing. Students would be able to stay in closer touch with the instructor on a continuous basis and they would benefit from the ideas, the understandings, the suggestions and the support of their peers. Boyd (1981) himself has been a long-time supporter of methods which would

support interactive completion of the cybernetic modeling task: "if educators are to assimilate the cybernetic systems paradigm to their work, it is essential that they have guided project experience in doing so. If it is possible for pairs or teams of graduate students to work together they should do so, not only because real tasks in all their complexity require a lot of work but also because the supportive and critical dialogue which ensues greatly enhances the work" (p. 286).

Details concerning the content of this project (including criteria for selection by students of a focal system to be analyzed) are provided in Appendix A (Boyd, 1988; 1980). Beginning with phase 2 of the project (i.e., once all students had selected a project which was approved by the instructor, following discussion on-line), students were instructed to enter all their responses to the project "questions" in the conference and topic to which they were assigned. Discussion about the project material and relevant cybernetic concepts and principles then took place among the students and instructors in each of the project topics. In order to maintain a high degree of regularity in student participation, as well as coherence and structure in the discussion and uniformity in the relative degree of advancement of student projects, a phased approach was taken whereby work on a particular portion of the project had to be carried out and entered within a one to two-week period (see Table 1 below). Mason (1987) alludes to the problems of a more

'laissez-faire' approach: "Unless users log in frequently and regularly respond to the drift of the 'conversation', there is no possibility of maintaining the thinking current in themselves or in the larger mind of the conference. Where courses are delivered entirely on-line this problem is much less likely to occur. But where conferencing is an extra 'goody' for students or university staff to experience, the higher level uses of conferencing are much more difficult to sustain" (p. 37). A small minority of students did not manage to keep pace with the project phases for a variety of reasons, and the wisdom of the approach was confirmed by the sometimes negative reactions of their peers, frustrated at having to read and comment on material which they had themselves covered in their projects some weeks before.

Since it is currently impossible to input or transfer standard PC-type graphics files to CoSy, students were instructed to make copies of any diagrams related to their project (e.g., flowcharts, graphic representations of feedback loops, etc.) for distribution during class time. A few particularly patient students took the time to create their diagrams with text characters only and entered these directly in the project conference (Appendix E includes an example of th¹s).

Table 1

Timetable of cybernetic modeling project

PHASE	CONTENT	START	FINISH
1	Selection of Focal System	Sept. 19	Oct. 3
2	Identity and Ownership	Oct. 3	Oct. 17
3	Context and Environment	Oct. 17	Oct. 24
4	Internal Structure	Oct. 24	Nov. 7
5	Behaviour and Viability	Nov. 7	Nov. 21
6	Prescription	Nov. 21	Nov. 28

Instructions to the control and experimental groups. At the beginning of the course, students were informed that an experiment related to the educational use of computer conferencing would be carried out during the semester. Written consent to participate in the study was solicited and all students agreed to take part. On the evening of class just before the actual project work was to begin, students were provided with printed instructions related to the following: a) the structure and timetable of the on-line project, b) the conferences and topics where project work would take place, c) the guidelines for participation (equal importance of comments and answers, frequency of log-ons, length of messages, taking time to reflect and so on), d) the evaluation criteria to be used by peers and by the instructor (these consisted of the already described evaluation dimensions of depth, organization and creativity), e) the procedures and guidelines for using the evaluation software features (for the experimental groups only), and f) the use

of anonymous ID's (for the control group only). The instructions (which are found in their entirety in Appendix B) were also entered in appropriate conferences on the CoSy system. While most of the instructions were common to all three groups, the information concerning the evaluation features was only made available to the two experimental groups. Furthermore, these two groups received slightly different instructions reflecting the difference in treatment (evaluation features functioning with "full" versus limited feedback to evaluators). In order to limit contamination of the experiment caused by knowledge of the experimental goals and treatments, students were asked to cooperate with the experimenter by not speaking to or soliciting information from students in other groups for the duration of the eight-week project period. (Based on comments made by students during the post-experimental debriefing, secrecy was in fact maintained over the course of the experiment).

Two details contained in the instructions to students must be highlighted. First, all three groups were told about the three evaluation/quality dimensions upon which projects would be graded, although only students in the experimental groups would have the opportunity of making explicit use of the dimensions to quantitatively rate the work of their peers, via the evaluation features. Students in the control group were given identical information about the dimensions and asked to keep them in mind and apply them as they composed their responses related to their own project and

made comments on the entries of other students. This approach, similar to that used by Daningburg & Schmid (1987) in the context of PEAC experiments (in which users of hand-held evaluation devices rated a particular dimension of a TV program on a four-point scale, while non-users in the control group were requested to keep the dimension in mind for future examination), was an attempt to keep all groups on an equal footing with respect to knowledge of quality-related expectations.

Secondly, the control group was provided with information concerning the use of pseudonyms for the purpose of making evaluative comments without having to reveal one's name. This was done to compensate for the fact that ratings entered by student using the evaluation features were anonymous (i.e., the author of a message could not associate the name of an evaluator with the rating given). Although little data is available on the counter-inhibitory effects of anonymity on performance in evaluation situations, it was thought worthwhile to try to make conditions in all groups as equivalent as possible. In support of this measure, Lundgren-Cayrol (1989) did find evidence in at least one previous course at Concordia University where computer conferencing was used, that although most students did not have positive attitudes towards anonymity <u>prior</u> to using the medium, a majority perceived its advantage <u>after</u> their experiences with educational CMC.

Moderating and instructional support. The project conferences were moderated by the instructor and tutor (the latter was also the experimenter). General guidelines for moderating computer conferences, as reported in Brochet (1985), were applied as closely as possible throughout the initiation, operational and closing phases of the on-line work. Additional guidelines were devised in order to ensure that all moderators behaved in similar ways in all three project conferences and that they did not directly influence the quality of student work on-line and the quality of peer evaluations (the main dependent variables). Specifically, moderators were instructed to avoid making evaluative comments in response to student contributions, and to focus instead on requests for clarification, suggestions for elaboration and the provision of definitions of key concepts or principles when these appeared to be used inappropriately (such definitions or interpretations were entered in all three conferences, even if a specific request originated from only one of them). Of course, moderators were also instructed to always abstain from evaluating student contributions via quantitative rankings.

It had been predicted prior to the beginning of the course that effective moderation and instructional support would require additional staff besides the instructor and the author, based on previous experience with the medium. Unfortunately, efforts to hire two additional teaching assistants for this purpose were too little too late, and for a variety

of reasons, two potential assistants who initially were involved with the project could not continue their involvement for the length of the experiment. As a result, students in all groups did not receive as much support on-line as they should have.

Independent evaluations of student work. In order to quantify the key variable of the study, namely the quality of student work over time, two independent evaluators were engaged after the experiment to review the work of students. Both were very familiar with the course content; the first had been course instructor on three occasions and the second had completed the course very successfully and had participated in two previous on-line trials with earlier offerings of the course. And of course, neither had been involved in any other way with the present study, the subjects or the current offering of the course.

The experimenter met with both evaluators (separately) in order to instruct them on the desired interpretation of the evaluation dimensions and on the approach to be taken with respect to coming up with an average rating for a group of messages in each transcript (see below for details). The transcripts were given to the evaluators in no particular order, and it was up to them to determine how best to organize their evaluation task (student by student, period by period, etc.).

With 15 students participating in the study over four two-week periods, each student having been assigned a

specific computer conference "topic" (a computer conference file distinct from all others), sixty two-week transcripts were to be evaluated. In their original form, as stored in the host computer's memory, each of these transcripts consisted of all messages contributed by and exchanged among a) a student working on a specific project topic, b) his peers and c) the course instructor and the on-line tutor. The transcripts were downloaded to files on diskettes and the following conditioning was carried out in order to prepare the data for independent evaluations:

1. All student CoSy ID's (student's first name followed by the first letter of their last name) were removed from message headers and replaced by pseudonyms (e.g., red, blue, green, etc.), so as to maintain confidentiality and avoid contamination due to the evaluators' possible previous knowledge of students. The pseudonym of the student "owning" the topic under consideration was highlighted so as to direct the attention of the evaluators to those messages (relevant messages from peers or instructors were left in since these represented an important part of the context for the student's own contributions).

2. All "waste" messages were removed. This included messages which had been withdrawn by the originator or the moderator (in CoSy, only the text is removed, leaving the header and a short standard annotation), empty or nonsense messages which had been added accidentally by students, and messages which were exact duplications of other messages

(these may have been added to the conference twice if a student had trouble adding or locating the first one).

3. All messages not directly related to the course content, the project topic under consideration or to the students' work on this topic were also removed. These consisted of humorous exchanges (certainly very beneficial to the health of a computer conference, but not directly relevant to the study), comments made about the conferencing system itself or about the conferencing process, questions or comments about administrative matters, and so on. It should be noted that judgments made regarding relevance had nothing to do with the length or any other generic aspect of messages (i.e., messages as seemingly insignificant as "I agree with you" were conserved if they formed part of a substantive topic-related discussion).

4. All special message headers displaying the compiled results of the quantitative peer evaluations were removed from the transcripts of the two experimental groups.

In quantitative terms, the conditioning of the data had the impact of reducing the inventory of conference messages by 14%, from an initial total of 1810 messages to a substantive total of 1562 messages. In more practical terms, it was intended to keep the attention of the evaluators focused on the content of the student projects and on the quality of student work. Although the evaluators were instructed to rate the quality of only one student's work in each transcript (i.e., not the work of the peers also taking part in the

discussion), all substantive messages by all conference participants were conserved to provide the necessary context for evaluation. In most of the conferences, much discussion took place among students, their peers and the instructor and tutor; only conserving one student's contributions, aside from making a significant proportion of these meaningless (e.g., responses to specific queries), would have removed some secondary indicators of quality, such as cases where requests for deeper probing are fulfilled with zeal, or perhaps ignored.

It should be noted that a student entering contributions in her own project topic both a) input direct responses to the "questions" contained in the project assignment (e.g., Question 2 of Phase 3 required students to state and explain the boundaries of their focal system), and b) responded to inquiries from instructors or peers. The evaluators were asked to focus primarily on the former in making their ratings, but to consider the second kind of contribution when the quality of the first was uneven.

The independent evaluators were asked to provide a table summarizing their ratings of the quality of student work on-line. For each of the sixty transcripts (one student's work over a two-week period), evaluators came up with three average ratings (corresponding to the three evaluation/ quality dimensions already described) on the same 10-point scale used by students with access to the evaluation features. This was judged to be the only practicable way to

get equivalent readings of student performance, since the number and length of student messages in each transcript covered such a wide range (varying from a minimum of zero to a maximum of 77, and from very short one-line answers or statements to two-page essays!).

Statistical Analysis. The three dimensions of quality used by the students and by the independent evaluators were intended to be combined to represent a global measure of quality in student contributions. It was of no particular interest to the experimenter to find that the peer evaluation structures involved in the experimental treatments affected the depth of student work more than its organization or apparent creativity. Rather, the concept of quality in an academic context was broken down into three more or less independent dimensions in order to make judgments about quality less dependent on personal interpretations of the concept. The selection of three dimensions, as opposed to a larger number which may have led to a more "accurate" depiction of the concept, was intended to make the task of evaluating on-line work as manageable as possible for the students.

Because of this pre-eminence of the larger concept of quality over its subsidiary dimensions, it would have been preferable to apply multivariate methods to the analysis of changes in the quality of student work over time. However, the number of subjects was judged to be too small for a conservative approach like multiple analysis of variance to

make apparent any small treatment effects which may be present. Therefore, three univariate analyses were applied to the individual dimensions, in order to determine differences in mean ratings (by evaluators) among treatment groups and/or over the four time periods of the experiment. The three dimensions were also kept separate for the measurement of the correlation between the ratings of the two evaluators, used to verify inter-rater reliability.

In order to judge the quality (and changes therein) of quantitative peer evaluations over the course of the experiment, both correlations and t-tests were used to compare mean student ratings with those of the independent evaluators, again for each dimension.

Chapter 3

Results

Participation Rates

In order to present data on participation rates which would be as simple and meaningful as possible, a calculation was made of the volume of student, peer and instructor contributions in each project topic over the course of the eight-week experimental period. The number of characters contained in all substantive messages were simply totaled and then converted into the number of pages (a page was defined as containing 1500 characters, roughly equivalent to a type-written double-spaced page such as this one). These totals were not calculated for each two-week segment since increases or decreases in the quantity of participation were not of much interest for this study; Miloff (1990) examined this facet in her analysis of ETEC 606 conferencing. In any case, it was somewhat common for students' participation to vary from week to week because of other commitments and so on, so such detailed information likely would have been misleading.

Levels of participation were very varied among the three groups, as well as among the members of each group (see Figure 1). On average, participants in *alphabits* contributed the largest volume of content, while those in *gammarays* contributed the least. Members of *betabits*, the control group, were somewhere in between. Right from the beginning of the on-line project, it was clear that at least two members of *alphabits* had been "hooked" by the medium. They would log

Figure 1. Levels of participation of students, peers and instructors.

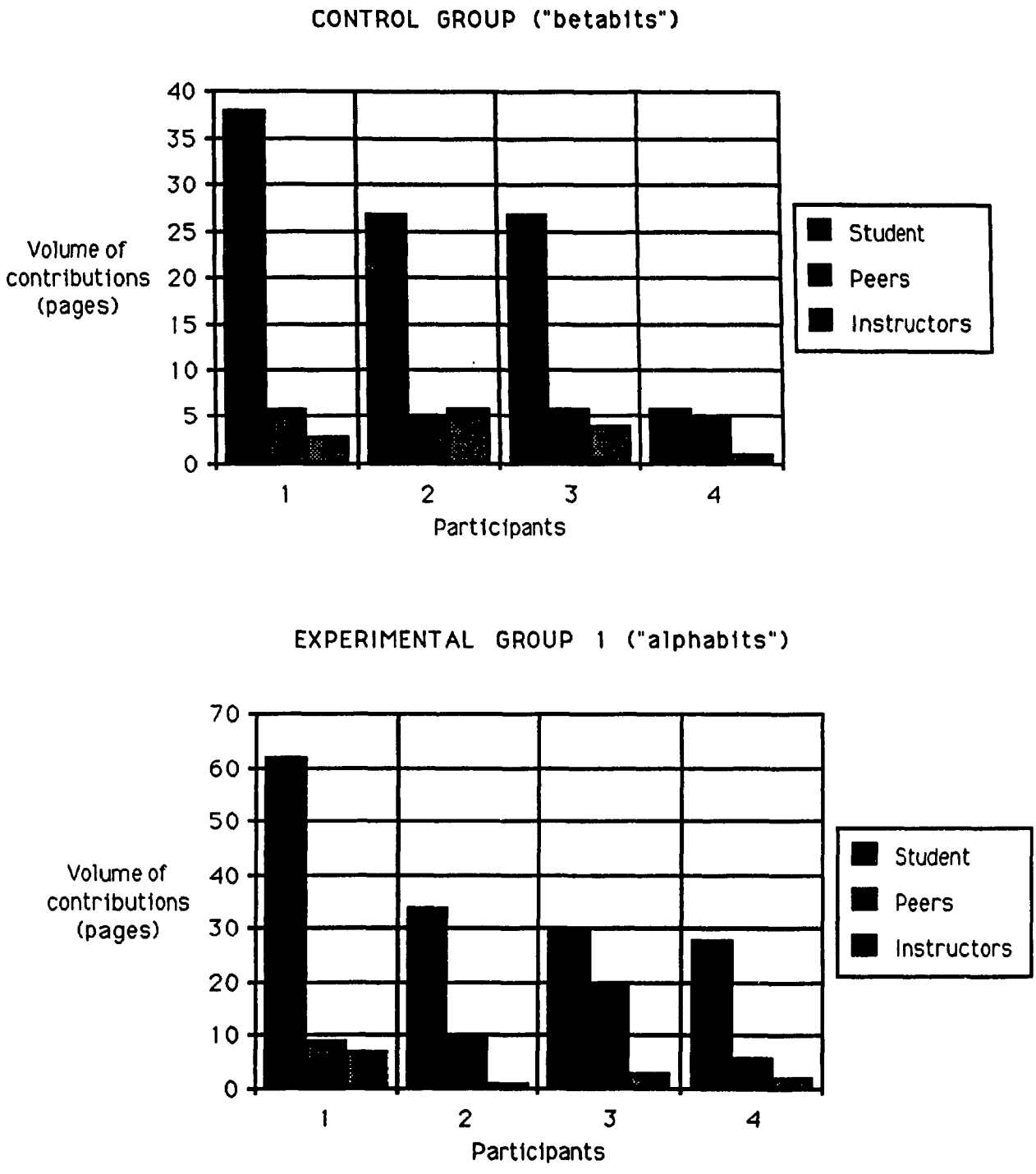
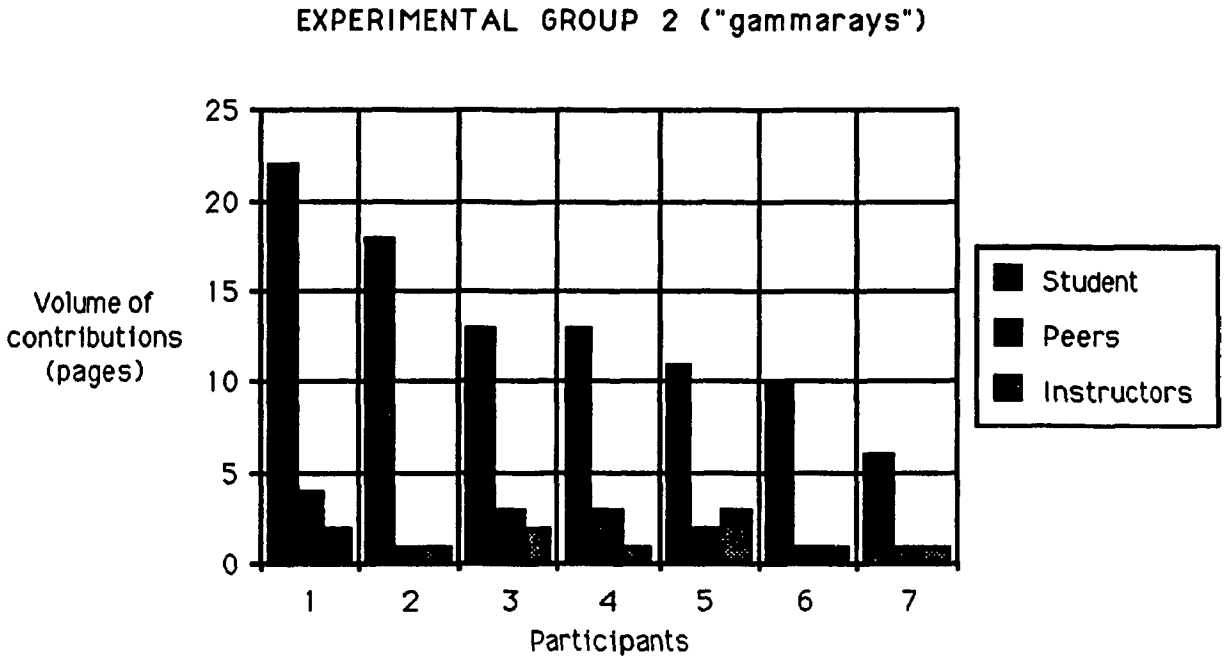


Figure 1. Levels of participation of students, peers and instructors (cont'd)



on just about every day (sometimes several times a day!) and their exchanges about the instructional task, the medium itself and other matters seemed to pull other group members along into very involved, sometimes intense, rounds of discussion. Interaction in the other two groups was not of the same magnitude, although not much different in terms of quality, as additional results below will show.

The overall proportions of student, peer and instructor participation were as follows: student contributions (i.e., students entering material in their own project topic) ranged from 73% of total participation in both *alphabits* and *beta-bits* to 78% in *gammarays;* peer contributions (i.e., students entering material in other students' project topics) varied

from 13% in *gammarays* to 21% in highly interactive *alphabits;* finally, instructor involvement went from a low of 6% in *alphabits* to 10% in *betabits,* although in absolute terms the volume of instructor contributions varied only slightly, from 11 to 14 "pages" of material.

Within each group, there were important variations in the degree of participation of individual members. No explicit guidelines concerning the "length" of student projects were provided, as is often the case in more traditional assignments; students were only told to limit the length of their messages to roughly one to two "screens" (equivalent to about one page of text), in order to make contributions easier to read, although it was understood that a response or comment could consist of several messages. In spite of this advice, some students insisted on inputting very long messages with hardly an occasional paragraph break. On the other end of the scale were those who split their contributions into a large number of very short messages. In fairness to the students concerned, the majority of which had never experienced computer conferencing previously, there are problems associated with the fact that the message is the *de facto* "unit" of discussion in CoSy, as in several other conferencing systems. Because of the absence of software features which would permit more sophisticated manipulation, indexing and structuring of inputs, undue pressure is placed on users to ensure that each message contains only one basic idea and that messages are sequenced correctly at the time of

input. If this is not done, other participants may have a difficult time understanding, searching for and commenting on elements of their peers' on-line work.

That being said, the total volume of some students' work was clearly below expectations. Although the modeling project clearly accounted for a very significant portion of students' eventual course grade, a few students contributed no more than five to ten pages of work on their own project topic. Perhaps the relaxed and rather informal nature of the conferencing environment led some participants to perceive the requirements of the instructional task in a similar light.

Inter-rater Reliability

As mentioned in a previous section, the quality of student on-line work was the object of evaluation by two independent raters after the end of the experiment. Based on 57 observations (15 subjects over four time periods, with three missing values due to students not having contributed any work during a particular two-week period), the correlation coefficients corresponding to inter-rater reliability on each of the three dimensions were as follows: .71 on the dimension of depth; .45 on the dimension of organization; and .61 on the dimension of creativity. While inter-rater reliability on the first and last dimensions can be considered satisfactory, the organization of student contributions was clearly perceived quite differently by the two raters. This can be partly explained by the fact that it was surely much more difficult to discriminate between samples of student

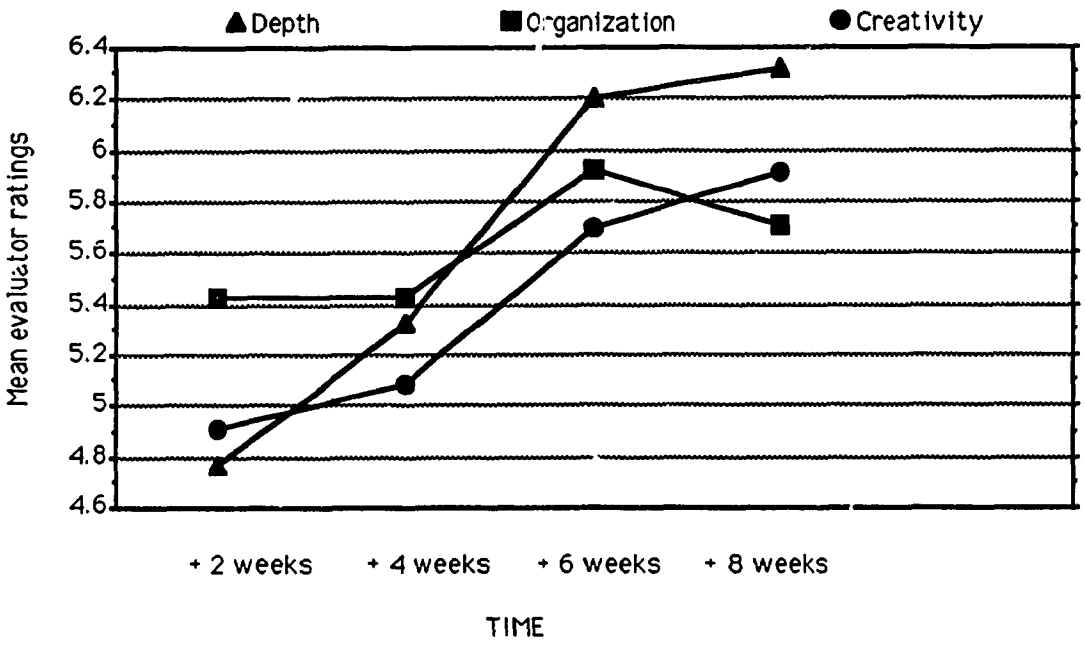
work on the basis of its organization than on the basis of demonstrated depth or creativity. As discussed previously, the simplistic structure and rudimentary editing functions of CoSy simply do not provide much opportunity for users to improve the formatting and organization of their inputs. Therefore, the chances of the evaluators "disagreeing" on this dimension on a ten-point scale would be greater than on the other two dimensions, which were much less affected by factors unrelated to the actual quality of contributions.

Impact of Peer Evaluation Structures on Quality of Student Work

The average ratings of the independent evaluators were used as the (dependent) measure of the quality of student on-line work over time. These ratings were analyzed with a two-way repeated measures analysis of variance for each of the three dimensions. On all three dimensions, results were similar. There were no significant differences among the three levels of treatment, either for depth, $F(2,10) = 3.19$, $p > .05$, for organization, $F(2,10) = 0.29$, $p > .05$, or for creativity, $F(2,10) = 2.57$, $p > .05$. However, differences were significant over the repeated measure, for depth, $F(3,10) = 7.41$, $p < .001$, for organization, $F(3,10) = 4.76$, $p = .008$, as well as for creativity, $F(3,10) = 7.05$, $p = .001$. There was no significant interaction between the levels of treatment and the repeated measure. In other words, the presence of software-based peer evaluation structures in both its "partial feedback" or "full feedback" forms did not

affect the quality of student work overall or over time, but the work of students as a whole did improve significantly over the course of the eight-week instructional task. This is represented graphically in Figure 2.

Figure 2. Quality of student work over time (2-week periods).



Further investigation of the improvement in quality over time revealed that significant differences occurred over two or three two-week periods, but not from one period to the next, as determined by the Fisher test of Pairwise Least Significant Difference and, to a lesser extent, by the more conservative Scheffe F-test. This was true for all three dimensions, as outlined in Table 2.

Table 2

Multiple comparisons over the eight-week experimental period.

Comparison	Depth		Organization		Creativity	
	$F_{Scheffe}$	Fisher PLSD	$F_{Scheffe}$	Fisher PLSD	$F_{Scheffe}$	Fisher PLSD
2 vs. 4 wks.	0.72	0.90	0.17	0.66	0.55	0.79
2 vs. 6 wks.	3.99*	0.90*	1.89	0.66*	2.71	0.79*
2 vs. 8 wks.	6.49*	0.90*	3.97*	0.66*	5.42*	0.79*
4 vs. 6 wks.	1.32	0.90	0.93	0.66	0.83	0.79
4 vs. 8 wks.	2.89*	0.90*	2.50	0.66*	2.53	0.79*
6 vs. 8 wks.	0.30	0.90	0.38	0.66	0.46	0.79

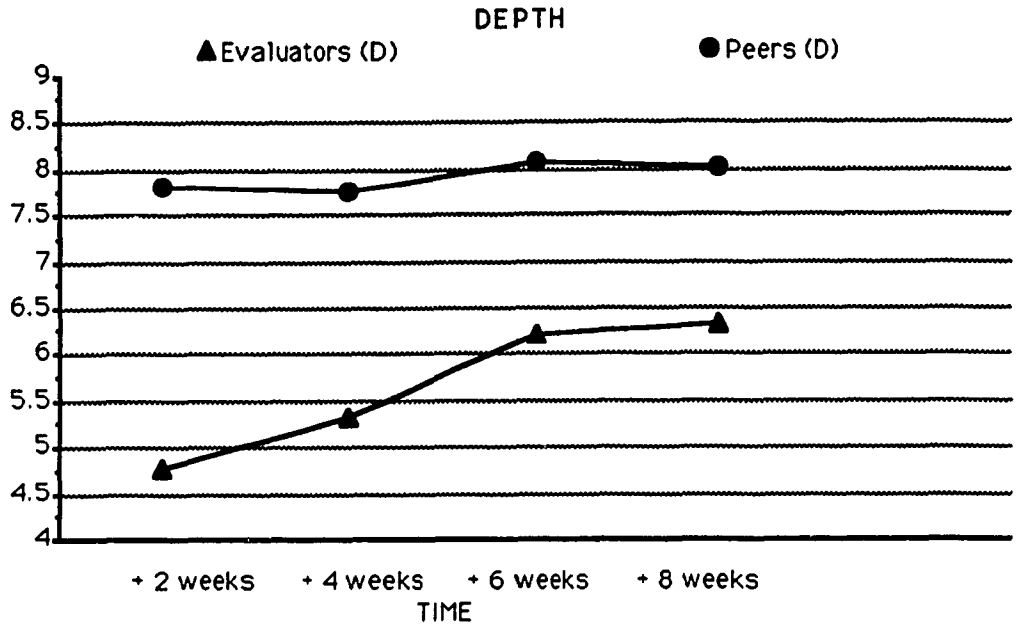
* $p < .05$

Quality of Peer Evaluations

In order to determine to what degree students could be relied upon to carry out good quality quantitative evaluations of their peers' work, their ratings were compared with those provided by the two independent evaluators. (Student mean ratings were determined by averaging compiled ratings of all substantive messages in each project topic for each two-week segment; compiled average ratings for each message were provided automatically by the software, and these consisted strictly of peer ratings since instructors always abstained from rating student contributions.)

Figure 3 illustrates the wide margin between student and evaluator ratings on all three dimensions. Paired t-tests of all 12 pairs of means confirmed that the differences were

Figure 3 Mean ratings of evaluators versus peers (2-week periods).



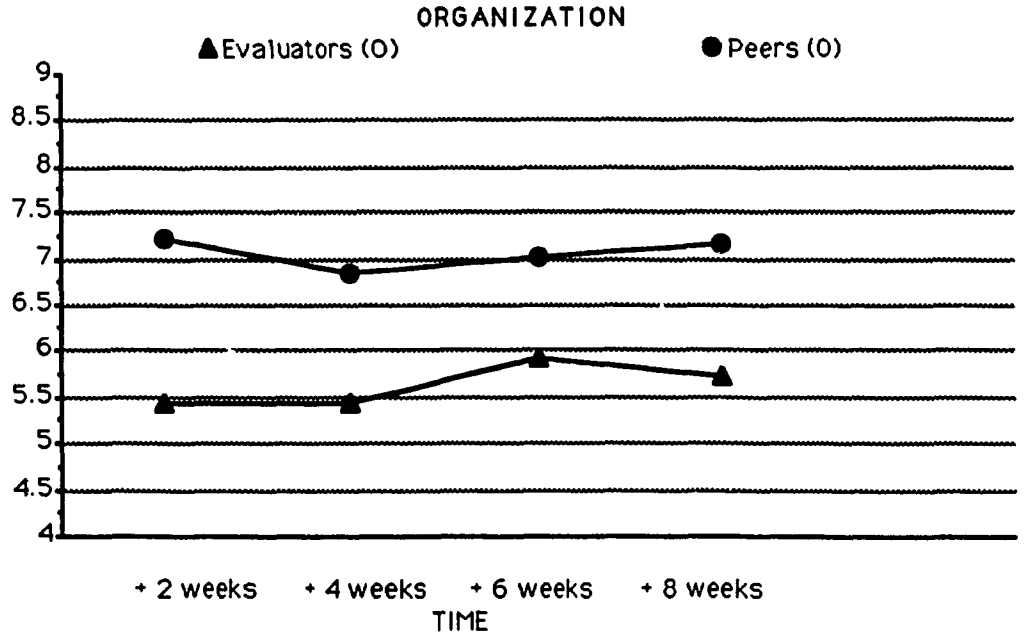


Figure 3. Mean ratings of evaluators versus peers (cont'd)

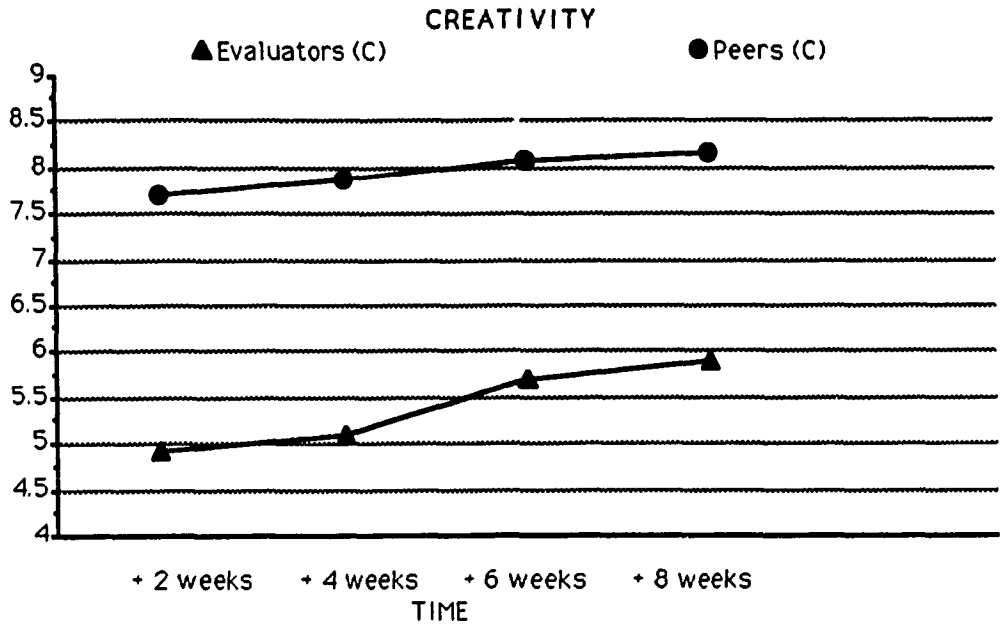
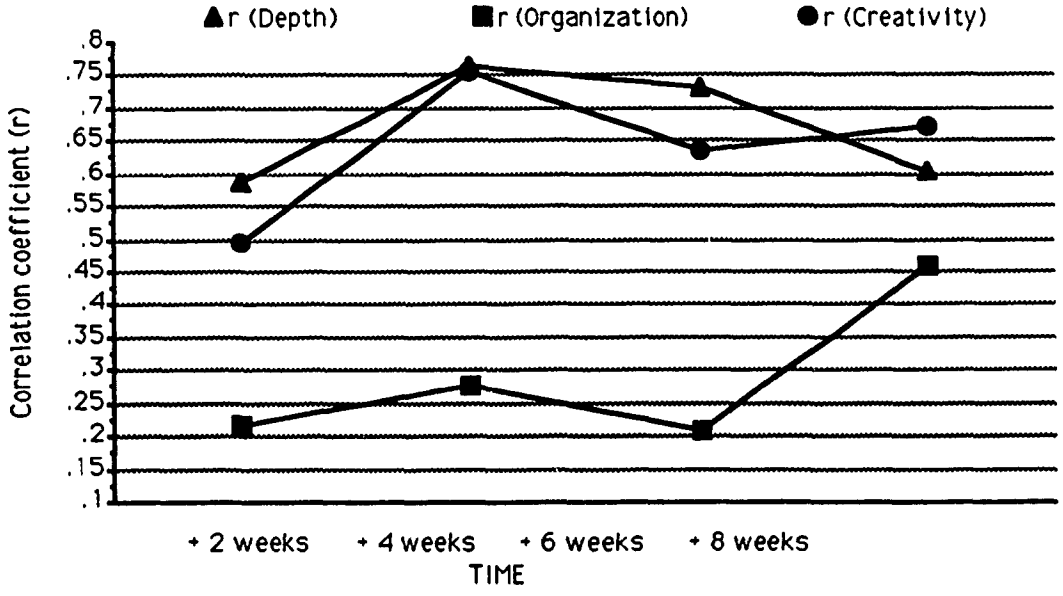


Figure 4. Correlation of evaluator and peer ratings (2-week periods).



indeed significant, with students consistently rating the work of their peers much higher than the evaluators. Correlations of student and evaluator ratings were also carried out (see Figure 4), with coefficients being roughly equivalent to those resulting from the analysis of inter-rater reliability (i.e., moderately high correlations on the dimensions of depth and creativity and a low correlation on the dimension of organization). However, there was no evidence of student ratings becoming more highly correlated with those of the evaluators over time. Further investigation of the quality of student ratings was therefore not warranted, particularly in light of the less-than-encouraging attitudinal data which is presented next.

Student Attitudes Towards Educational Computer Conferencing

The attitude instrument administered at the end of the course and completed by 17 class members was comprised of Likert-scale items (using a 1-to-5 "agree-disagree" scale or other quantitative or qualitative terms) on general perceptions of the use of computer conferencing, details concerning participation and details concerning feedback and evaluation (see Appendix C). Each section of the questionnaire included space for additional comments, which students used willingly.

Based on the results presented in Figure 5, the experience with educational computer conferencing was generally perceived as positive, though by no means overwhelmingly. While most students felt that, in a practical sense, they were adequately prepared for the use of the medium and

adequately supported during the course, perceptions of considerable additional effort required by the medium were widespread and are almost surely behind the lukewarm feelings about undertaking another similar experience in the future. With regard to computer conferencing being a "key element in a superior learning experience", several students correctly called attention to the ambiguous nature of the question, stating that the medium itself was not necessarily a determining factor in the quality of the course as a whole.

Concerning the frequency and time requirements of participation by students, members of *alphabits* were, as previously alluded to, heavier users than their peers and also felt to a moderate degree that they spent too much time on their conferencing activities. Based on student reports of frequency of participation and the fact that members of the other two groups felt they spent moderately too little time on CoSy, the guideline asking students to log on every two days or so seems in retrospect to have been quite reasonable. Clearly, however, students who had access to their own equipment had a much easier time meeting this target.

In spite of the training and encouragement aimed at getting students to use the "downloading" and "uploading" features of CoSy (allowing users to read and compose messages off-line, thus avoiding the pressure associated with working on-line, including automatic log-off after five minutes of inactivity), most participants were delinquent in this regard. Especially with members of *gammarays*, uploading was

more popular than downloading, which is understandable considering the problems associated with using CoSy's limited line editor for composing messages on-line. The actual frequency of downloading and uploading was probably even lower than the responses to the related questions suggest, since it appears that several students at the end of the course were still unsure about the meaning of these terms.

Figure 5. Student responses on general attitude questions.

Question	"Mean" response
ß = *betabits* or CONTROL GROUP - no fb. å = *alphabits* or EXPER. GROUP 1 - partial fb. ¥ = *gammarays* or EXPER. GROUP 2 - full fb.	<<< Strongly agree >>> Strongly disagree
The use of computer conferencing in ET 606 was a key element in a superior learning experience.	1 2 3 4 5 åß¥
The use of computer conferencing requires more effort on the part of students than traditional instruction.	1 2 3 4 5 ß å¥
I would register for another course requiring the use of computer conferencing as a learning medium.	1 2 3 4 5 ¥ ß å
The reference documentation, training workshops and on-line or telephone support were adequate.	1 2 3 4 5 å¥ß
I had sufficient access to reliable equipment to do my computer conferencing work when I wanted to.	1 2 3 4 5 å ¥ ß
How OFTEN did you get on CoSy to read messages and/or to add your contributions/ comments (on the average)?	ß (betabits): 2 times/week å (alphabits): 3-4 times/wk ¥ (gammarays): 2 times/week

How do you feel about the AMOUNT OF TIME you spent on your computer conferencing activities (circle one)?

NOT ENOUGH	ABOUT RIGHT	TOO MUCH
¥ ß	å	

Figure 5. Student responses to general attitude questions (cont'd).

How often did you download other people's messages in order to have more time to read them (circle one)?

ALMOST ALWAYS ——— SOMETIMES ——— RARELY OR NOT AT ALL

B Å Ÿ

How often did you upload your messages, after having composed them when you were not on CoSy (circle one)?

ALMOST ALWAYS ——— SOMETIMES ——— RARELY OR NOT AT ALL

Ÿ ÅB

Rate the overall QUANTITY of feedback you received from other students.

NOT ENOUGH ——— ABOUT RIGHT ——— TOO MUCH

Ÿ Å B

Rate the overall QUANTITY of feedback received from the instructor/tutor

NOT ENOUGH ——— ABOUT RIGHT ——— TOO MUCH

Å BŸ

Rate the overall QUALITY of feedback you received from other students.

SUPERIOR ——— ADEQUATE ——— INADEQUATE

Å B Ÿ

Rate the overall QUALITY of feedback received from the instructor/tutor.

SUPERIOR ——— ADEQUATE ——— INADEQUATE

ÅB Ÿ

Rate the overall TIMING of the feedback you received from others.

GOT IT WHEN I NEEDED IT ——— GOT IT TOO LATE

Å B Ÿ

Rate the IMPACT of the feedback received on the quality of your work.

LARGE IMPACT ——— SOME IMPACT ——— LITTLE IMPACT

B Å Ÿ

Responses to the items pertaining to student perceptions of the feedback and evaluation aspects of the conferencing experience (by design, these questions implicitly referred to the qualitative comments of peers and instructors, rather than to the quantitative peer ratings) reveal a moderate level of satisfaction with the quality of feedback and a

slightly lower level of satisfaction with its quantity. Students in *gammarays* were generally less satisfied with the quantity and the quality of feedback and evaluation than participants in the other two groups. It should be noted that since there were seven active members in this group, compared with four active members in both *alphabits* and *betabits*, providing feedback and evaluation was more of a challenge here. This is also reflected in the perceptions of the timing of the feedback: students in *alphabits* thought feedback was given when needed, while those in *gammarays* complained that it was generally provided too late.

Finally, the lower perceived quality and quantity of feedback in *gammarays* led members of this group to see feedback as having only "some" impact on the quality of their work, but students in the other two groups perceived feedback and evaluation as having quite considerable impact.

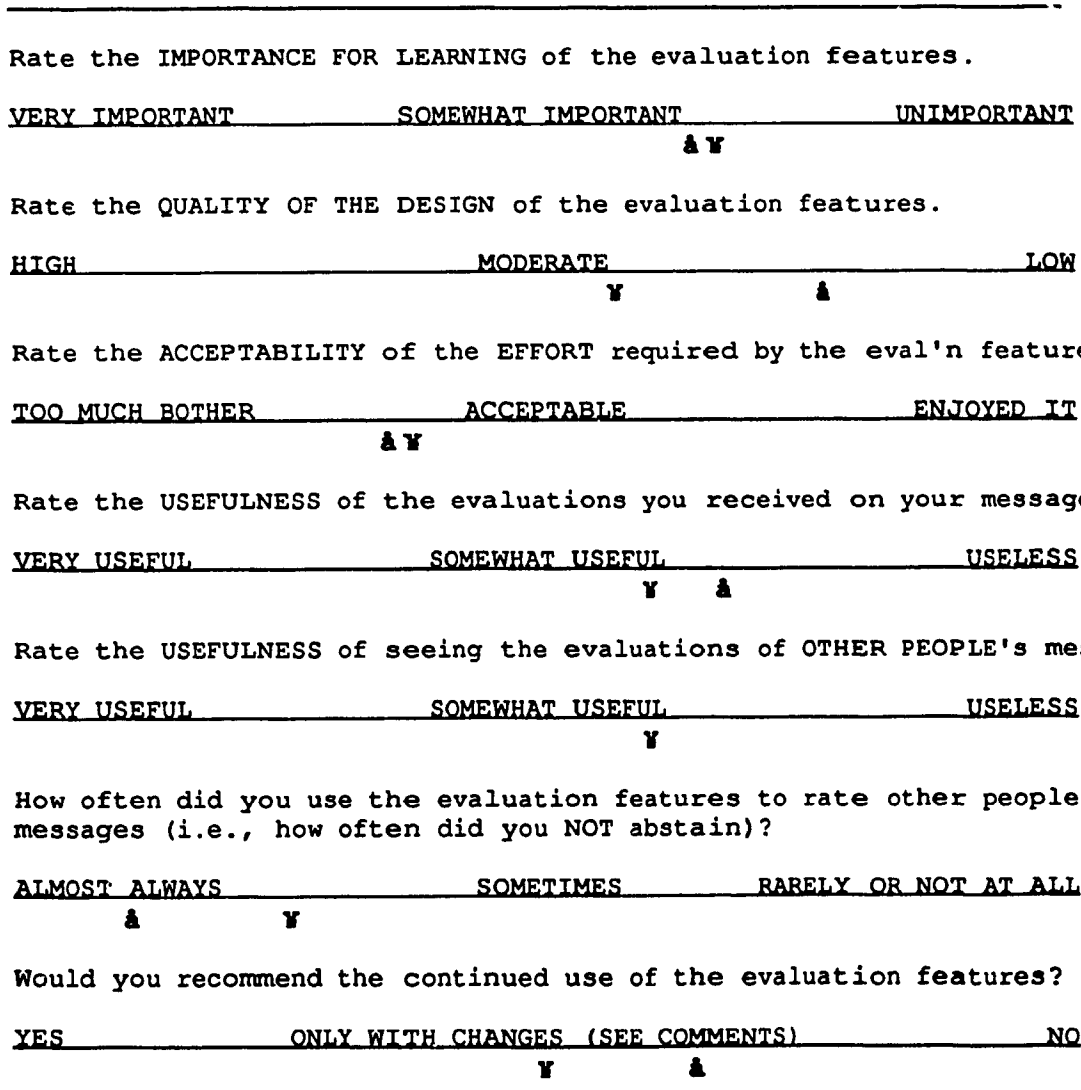
Student Attitudes Towards the Peer Evaluation Structures

Members of the two experimental groups, who were required to make use of the software-based peer evaluation structures, responded to additional items on this aspect of the experiment (see Figure 6). Responses from *alphabits* and *gammarays* were quite similar (except on the item concerning the quality of the design of the evaluation features), and consistently negative. The evaluation features were perceived as only slightly important for learning, not very well designed and a bit of a bother to use. The ratings of students' contributions, as well as the display of ratings of their

peers' work (in the case of *gammarays*), were not perceived as particularly useful, and respondents did not recommend future use of the features without changes being made. The frequency of use of the evaluation features, however, was high (i.e., students did not use the abstention option very often).

Reasons given by students (in written, on-line or 'face-to-face' comments) for their negative attitudes towards the evaluation features are discussed in the next chapter.

Figure 6. Student responses on specific attitude questions.



Chapter 4

Discussion

Impact and Perceptions of Peer Evaluation

Although the results of this study are based on a rather small number of subjects, there is clearly no evidence that students who had access to software-based peer evaluation structures performed better over time than their colleagues with no access to such structures. It was encouraging to find that students taken as a whole did improve their performance over the course of the eight-week cybernetic modeling project, but this would of course be expected.

Even if results related to the quality of student work had revealed significant differences due to the experimental treatments, these would have been largely infirmed by the accounts given by students of their utilization of the evaluation features, as well as by student perceptions about these same features. For example, the records of student ratings in certain conferences as well as comments made during the debriefing exercise revealed that at least two students, after a short initial period of reasonably thoughtful evaluations, began to consistently award ratings of '10' on every dimension to every contribution submitted by their peers. When asked about this practice, one of the students claimed that the participants in the conference would have perceived anything other than the maximum rating as an "insult" (it was implied that the group had attained a high level of performance for which lower grades would have been

inappropriate, although this quality of performance was not reflected in the ratings of the independent evaluators). Another student admitted to almost always giving ratings of '9' simply because this number was the closest to the Return key on the keyboard! (This comment caused considerable laughter during the debriefing, as well as threats by the distraught experimenter to strike it from the record). While such rather extreme practices were not widespread, data generated by the modified conferencing software do suggest that a considerable number of students almost always gave the same rating on all three dimensions (e.g., '7, 7, 7', as opposed to '4, 8, 5'), further supporting the conclusion that many students did not undertake the task of quantitative peer evaluations with much seriousness. Correspondingly, the results from the post-experimental questionnaire already presented showed that students generally did not perceive the product of the peer evaluations (the actual ratings) as having much use, whether these related to only their own messages or the messages of all group members.

The reasons given by students for not paying much attention to and not appreciating the peer evaluation structures included the following (the figure in parentheses specifies the number of students who called attention to the item in question):

- evaluations had to be performed too often (i.e., on every message), causing students to simply tire of it

and/or perceive it as "noise" or as having little value (7);

- numeric evaluations were judged inferior to evaluation by way of comments, or were seen to interfere with the latter (6);
- evaluating a message before having a chance to see related messages and comments was seen as inappropriate (3) - see details in section on technical considerations;
- students did not feel sufficiently qualified to evaluate their peers on material which they were just learning themselves (2).

The course instructor felt he could have helped students take the evaluation structures more seriously if he had made an explicit link between the rating activity and final grades. While this is likely, it also would have made it more difficult to give a fair account of the acceptability of the structures.

Considering the large number of messages generated in most project conferences, the complaint of students regarding the excessive frequency of evaluations is justified. It must be added, however, that students were encouraged to use the abstention feature only when required and were told to use their own judgment to decide when a message was substantive enough to warrant evaluation on the three dimensions of quality. Apparently, several students had difficulty making

these decisions and felt compelled to rate every message save those which were very obviously trivial or unimportant.

The high number of evaluations required was also due in part to a previously mentioned constraint involving the structure of the CoSy software. Since the message is the fundamental unit of information managed by the software, the evaluation features could not be designed to address anything but individual messages. It was then up to students to make each of their messages substantial enough so that subsequent ratings would be both warranted and meaningful. Clear and frequent directives to this effect by the instructors did not succeed in all cases, so some project conferences contained long series of short messages which would have been much better condensed into a few substantial ones. Short of forcing students to rearrange and re-enter messages which are either too short or too long, little could be done to control this aspect of the conferencing process. Perhaps new more visual approaches to the design of CMC interfaces also involving principles of hypertext, such as that studied recently by Romiszowski and Jost (1990), will allow developers to provide users with much better cues regarding the length and other characteristics of their inputs.

A possible approach to limiting the number of evaluations to be carried out was proposed by one of the students, who suggested that only the "original" contributions of students in their project topics be rated, thus leaving out all comments from peers and subsequent responses. While this

particular solution applies only to the specific context of this study, the message was clear: be very explicit about the type of input to be rated and limit the overall number of evaluations to prevent "rating fatigue". An alternative partial solution, put forth by the course instructor during the debriefing, would have involved modifying the activation of the evaluation features so as to require the author of a message to either request or not request evaluation of her contribution. This approach may have the advantage of making the subsequent ratings considerably more meaningful to students and hence more determinant of future performance. Alternatively, based on findings reported by Beaven (1977), it may be wise to use the peer evalution structures only in the early stages of on-line work and subsequently return to a more unstructured and qualitative approach.

The second most often stated reason for not liking the peer evaluation features appeared to reflect plain and simple distaste of quantitative ratings as a means of evaluating on-going performance. Some students were clearly of this opinion; however, some comments related more specifically to a lack of understanding or else a disagreement with the dimensions used for evaluation (e.g., "I don't know how much depth is required to have a complete answer" and "what would have been more helpful to me would have been... one simple dimension: how helpful was this to me in terms of my understanding of cybernetics?"). Very possibly, a weakness in the procedures was the failure to involve students in the

selection and clarification of the evaluative dimensions, a practice which Baron (1986) recommends: "ideally, (the determination of evaluation criteria) should include the students, because until they both understand and internalize the evaluation criteria, they are less likely to incorporate them into their behavior" (p. 225).

It is also conceivable that the lack of explicit instruction concerning peer evaluation was partly responsible for the low level of appreciation of the software modifications. Gilbert (1986) reports that in a study involving student use of metacognitive strategies (planning, monitoring and evaluation), students who were targeted by very explicit inducement of strategy use (i.e., direct training and modeling) performed nearly twice as well as their peers. However, these explicit inducements did not need to be elaborate or very time consuming, consisting of 45 minutes of instruction in this case. In the context of the present study, inducement was limited to written instructions and guidelines, since it was thought that more involved training of students concerning the peer evaluation structures would have introduced a confounding variable and a threat to validity. The same level of training would not have been given to the control group, and it would have been necessary to train the groups independently and therefore draw their attention to the evaluation features which played a central role in the experimental treatments. In hindsight, more effort should have been put into designing and providing

different but equivalent training to the three treatment groups. Probably, this would also have addressed the fourth problem cited above by those students who felt underqualified to rate the work of their peers, although this reservation was perhaps more due to a lack of familiarity with the content of the course than to inexperience with peer ratings.

Technical Considerations

In addition to general limitations of the conferencing software used for this study, some of which have been discussed already, the technical implementation of the peer evaluation structures was somewhat of a hindrance to students. Some would have preferred to be able to look ahead at all comments on the current message before having to evaluate it. Technically, displaying subsequent messages without first evaluating the current one was possible, but the students were only informed of the required procedure explicitly after their complaints were made known. The way to see these messages was via a "new" command which displayed all new messages on the screen continuously, or the "file new" command structure which permitted users to put all new messages in the CoSy scratchpad (temporary storage) area. This latter approach, of which students were informed right at the start of the experiment, was the first step of the downloading procedure which allowed users to transfer a block of messages to a text file on a diskette and to read them at their leisure after having logged off from CoSy. The initial decision to encourage the "filing" of new messages, as

opposed to permitting users to read several new messages on-line and evaluate them immediately, was aimed at getting students to take the time to reflect on their evaluations. Although the asynchronous nature of computer conferencing provides ample time for reflection on contributions and comments, the reality of the medium's use in education is one where significant quality problems do exist. This shortcoming, discussed in the first chapter, was the primary rationale for the introduction of software-based peer evaluation structures.

Unfortunately, the reflection-inducing downloading procedure was not adopted by the majority of students, in spite of very explicit instructions given during the training workshops and in the technical documentation. Those who did download and upload consistently reported that it was "a piece of cake" but the procedures were simply too much bother for most. There is no doubt that file transfer procedures in CMC have some way to go before being readily accessible to neophyte users.

It is worth noting that the issue of forced versus optional rating of the current message (corresponding, albeit in a roundabout technical way, to considered versus more immediate evaluations) was the subject of some debate between members of the research team. Preference for evaluations nurtured by reflection was countered with a position favouring quicker and more instinctive ratings, which is how most evaluations were in effect carried out. However much time was

taken to rate the contributions of peers, there was no direct evidence to suggest that the task of evaluation caused students to reflect more deeply during the process of composing their subsequent contributions, which was the ultimate objective of the software modifications.

Another, more justified, complaint of students concerned the difficulty of consulting the referent message when a comment on a previous message was being evaluated (CoSy allows users to specify, via the "comment" command, when a message they are inputting relates to a previous entry). The design of the evaluation features did make it difficult for users to display a previous message while in the process of rating an entry, but here again, the problem did not even exist for those students who took up the practice of down-loading all the new messages at each log-on.

Another much simpler yet fairly critical problem was brought up by one student claiming to have accidentally abstained from rating messages on a number of occasions by typing 'a' for 'abstain' when he had intended to type 'a' for 'add' (based on the structure of the peer rating procedure, this actually does not make much sense, but users have surely done wilder things than this with CoSy commands!).

Technically speaking, the feedback function of the evaluation features was also somewhat constrained. One of the ideas governing the design and implementation of the software modifications was that students would benefit directly in two ways from seeing the compiled ratings of their entries:

first, the evaluations would represent implicit acknowledgement that their messages had at least been read (which is more than they would normally receive from the evil and feared lurkers); and secondly, their subsequent contributions would be informed by quantitative information summarizing how others perceived the quality of their work. Unfortunately, in order to see the results of the peer ratings, students had to display their own previous messages by typing in their numbers. CoSy would then display them, complete with the header containing the evaluation information (number of evaluations and the mean ratings on each dimension). Only some students were sufficiently motivated to go through this procedure. This shortcoming would have been partly overcome by an additional software modification consisting of a command ("myview" or something similar) which would have displayed the headers and first line of a range of an author's previous messages. While this was included in the specifications for the software modifications, it was not in the category of highest priority and could not be implemented in time for the experiment.

In more general terms, this study was subject to the same sort of technical contraints still common in CMC-assisted educational interventions. First, since the subjects were adults in their 20's, 30's and 40's (part of the generation only <u>partially</u> swept over by the computer wave), some had little or no prior experience with computers and were somewhat anxious about their central role in the course.

Obviously, these subjects also tended to be the ones without access to home computer equipment, and hence most affected by problems related to the availability and use of on-campus equipment. Although hardware arrangements, training and technical support were certainly adequate, problems did occur. Combined with the need for students to quickly learn to use three software programs and the cumbersome and only partially transparent nature of the conferencing software itself (CoSy has an annoyingly linear structure and has yet to enter the domain of graphical user interfaces), there is no doubt that these factors created an obstacle to the performance of students and to the successful running of the experiment. One looks forward to the day when research with computer-based educational media can be carried out without such interferences.

Quality of Peer Evaluations

In light of both the considerable spread between student and evaluator ratings and the negative attitudes of students towards the evaluation features, it is clear that in this context the peer evaluations provided by students were not of a high quality. Moreover, the students who benefitted from the full feedback treatment (i.e., displays of ratings of their own and their peers' messages) did not perform better in this respect than their colleagues who were limited to seeing only ratings of their own entries. Therefore, in answer to one of the questions posed by this study, systematic peer evaluation does not necessarily reduce the workload

of the instructor/ moderator in CMC-supported courses. As discussed earlier, improvements to procedures used in the experiment (notably better training) could have also improved the evaluative performance of students, but only further research will tell. In any case, it is clear from responses on relevant items on the attitude questionnaire that students expect a lot from both peers and instructors, as far as feedback and evaluation are concerned. Its quantity and quality must both be high. If in general, students cannot be relied upon to carry out thoughtful and discriminating ratings of each other's work, then the instructor must take most of the responsibility for this task. Instructors who do not "trust" group evaluations and re-grade all student work, as reported by Beaven (1977), are perhaps justified. Indeed, it may well be more appropriate in most cases to direct the students' efforts towards making qualitative comments on their peers' contributions and leave quantitative feedback to the instructor.

Unfortunately, in an environment where evaluations are not in some way "forced" upon users, it is unlikely that qualitative comments will contain much useful evaluative information. In the present study, the control group did not have access to the evaluation features but they were told very explicitly to keep the three dimensions of quality in mind when making comments, and they were also provided with the simple means to make evaluative comments anonymously if they wished to do so (this was done so as to create a social

context for evaluation equivalent to that enjoyed by the experimental groups, since the software-supported ratings were also anonymous). In spite of this, none of the participants in *betabits* made use of their pseudonyms for the purpose of hiding their identity when making comments, and not a single message in this group's transcripts refers explicitly to the quality dimensions. In fact, no single message can be found in any of the transcripts which could be considered a serious and responsible attempt at criticizing in a constructive way the quality of someone else's work. (Even one student who persisted in entering two-page "paragraphs" in single messages kept receiving his usual '10' ratings on 'organization', with none of his peers venturing to suggest a more logical and readable way of organizing his thoughts!) The participants themselves lamented the quality of feedback from their peers with comments like the following:

- "I found that at times people seemed to be overly preoccupied with the quantity, as opposed to the quality, of comments they made... which made things drag on";
- "I am not sure that feedback from my classmates was right or not... Sometimes, it seemed that they (hadn't) read my project";
- "some comments from other students were not pertinent or were not delivered with any recommendations";

- "unfortunately, I found a lot of the feedback from students didn't apply cybernetic concepts (i.e., not much depth). The value of conferencing is lost if people don't make the effort to really critique the work done".

Others commented more generally about the quality and quantity of feedback available from peers as well as instructors:

- "most of the time I felt I was putting things in on CoSy and I never really knew whether it was correct or wrong";
- "I will be greatly distressed if and when I discover that after having collated and submitted my work - that as a result of only getting 'adequate' feedback - I get a poor mark. Formative evaluation is great when it's great".

It was surprising to encounter such resistance to evaluation among a group of graduate students, whom one would expect to be already comfortable with its practice. It would surely be worthwhile to pursue efforts to find ways of making peer evaluation both more effective and more palatable, particularly in the CMC environment where the signal to noise ratio (i.e., the ratio of quality to quantity of content) is relatively low.

The interpretation of results related to the quality of peer evaluations must take into account an important advantage which the independent evaluators had over their student

counterparts. The former were provided with transcripts of the on-line exchanges after the fact and were therefore able to evaluate two weeks' worth of work all at once. Students, on the other hand, rated contributions more or less as they were entered and could not benefit to the same extent from the context and other cues that a larger body of work provides. It would have been difficult to remediate this difference in the conditions provided to the two categories of evaluators, however, because the independent raters were not available to continuously rate messages over the eight-week experimental period. It does not escape the experimenter that evaluation of a larger body of contributions after the fact may in fact be another possible improvement to the peer evaluation procedures. This would not follow the intentions implicit in the design of the software peer evaluation features, but could nevertheless be accommodated by way of additional instructions to users.

The Trouble with Numbers

As illustrated earlier by certain comments made by subjects in the experimental groups, the difficulties experienced by those students using the peer evaluation features were at least partly due to their having to enter a number in response to a peer's contribution. While comments like "numbers serve to alienate rather than assist" quite eloquently state the case against quantitative ratings, the actual rating behaviour of students speaks even more loudly. Acquired habits of consistently giving the same rating to all

but the most trivial contributions and of refusing to discriminate between the three dimensions of quality probably say less about the possible laziness and irresponsibility of students than they do about the perceived excessive precision of the dimensions and rating scales. Considering the fact that the end product of any one student's on-line work resulted in one of only three possible grades (A, B or C), it was perhaps reasonable for subjects to think that filling in three 10-point scales for each substantive message was "too much bother". Especially for such frequent ratings, it would very likely have been sufficient for users to rate messages using a much simpler scale. Alexander & Lincoln (1989) and Boss (1988) have used such scales, albeit with unknown results, which consist simply of three points on a single scale which could represent agreement or quality, depending on the context. The three points represent a) agreement with the object of evaluation or its perception as being of superior quality, b) a neutral feeling about the object or perhaps simple acknowledgement or still its perception as being of average quality, and c) disagreement with the object or its perception as being of inferior quality. Stodolsky's (1984) scales also resemble these, but are applied over multiple dimensions, again with unknown results since this author's "automatic mediation of dialog" system was never implemented in a practical context (based on the information available to the author of the present study).

This more simple approach to the rating of messages would likely do an acceptable job of focusing the attention of students on the quality of their work (it would certainly be no worse than the approach actually used), and just as importantly, it would still address the feedback-related limitations of "unaided" computer conferencing (i.e., the frustration caused by those who read but do not comment on messages). In fact, several students reacted quite positively during the debriefing to the suggestion by one of their colleagues that simple acknowledgement of messages would go a long way towards making CMC interactions more satisfying and effective.

Factors Related to the Research and Instructional Contexts

All of the results reported here are, as usual, subject to only limited generalization due to the limitations and weaknesses of the study's design and implementation, as well as the particular instructional conditions present in the context of this section of ETEC 606. First, contrary to most of the studies involving the educational use of computer conferencing, this study was not carried out in a true distance education context. While the definition of this term can be debated, ETEC 606 was an on-campus course with most students participating regularly in weekly lecture periods with the instructor. The use of computer conferencing did not therefore receive the almost automatic initial approval it usually receives from students registered in distance education courses. Students were not isolated either from

each other or from the instructor, so CMC was in the more difficult position of having to prove itself as a superior (or at least equally effective) medium while on an equal footing with traditional instruction. Based on the overall marginally positive response of students concerning their willingness to take part in another CMC-supported course in the future, the medium performed rather well in this respect.

As in any research involving the use of new technologies in education, one cannot ignore the fundamental importance of instructional design as a determining factor in the educational effectiveness of computer conferencing in ETEC 606. While certain media, such as computer-based instruction and intelligent tutoring systems, cannot but impose a more systematic design upon instruction, the content-independent nature of computer conferencing makes its success or failure highly dependent on how well instructors manage to structure its instructional surroundings. The simple integration of a very flexible and well-designed computer conferencing system cannot be expected to improve the effectiveness of a course or program which suffers from ineffective or sloppy design. As Naidu (1989) points out, "suitable software and access to the equipment will not necessarily ensure (effective) conferencing" (p. 30).

For purposes of the present study, considerable care was taken to avoid problems experienced with earlier offerings of the CoSy-supported course. The on-line instructional environment was designed to have the following characteristics:

clear expectations for students regarding the content, the quality and the timeframe of on-line contributions and exchanges; an acceptable level of workload for students, as a result of a limited number of instructional tasks and a limited number of participants in each on-line conference; and an adequate level and quality of moderating interventions and feedback to students.

On the first point, the research team was successful, with the exception of previously mentioned problems related to uncertain expectations regarding the magnitude of student contributions on-line. On the second point, an uneven level of mortality in the three treatment groups resulted in two groups having only four members, leaving the third with seven (all three groups started with seven, and it was expected that five or six active participants would remain in each). The largest group did indeed report some problems related to the difficulty of keeping up with the contributions of all members. Success was not achieved on the final point, due to the insufficient on-line participation of the instructors.

The design of the lecture-based component of ETEC 606 was cause for some criticism from students. Specifically, some participants complained about the somewhat unstructured way in which new material about cybernetics was transmitted during lectures: "the classes bothered me in that I liked to read a specific article/chapter before or after class that is directly linked to class discussion... the positive effect (of using CoSy) was negated to some extent by a lack of

direction for specific readings" and "if I was to learn more of the cybernetic value (sic), I would have preferred more STRUCTURE, especially now having to write an exam on many terms not covered". When the time came to apply key principles and concepts in their on-line projects, some students were in difficulty because they remained unsure of definitions and of heuristics or rules for application. The course instructor had expected that students would fill in these content gaps from the assigned readings - a reasonable expectation for a graduate level course, but clearly some students required more explicit direction (and in fairness to them, the author has completed the course in question - on several occasions - and experienced similar difficulty in finding clear and comprehensive sources of information concerning definitions and examples of ideas from educational cybernetics). A solution to this instructional problem could include the creation of a detailed glossary of terms for students, to be distributed in print and/or on-line, and the preparation of a reliable list of sources (this was begun in some form in the previous section of the course, where students were required to carry out an inter-bibliography assignment on CoSy).

Chapter 5

Conclusions and Recommendations

Confirmation/Rejection of the Study's Hypotheses

The study's first hypothesis, which concerned the expectation that the use of peer evaluation structures would improve the quality of student work over time, was not confirmed. Overall, with all three treatment groups taken together, the work of students did show significant improvement over the eight-week experimental period, but analysis yielded no significant differences between or among the control group and the experimental groups.

Definitive conclusions cannot be drawn from this result. Problems related to the implementation of the evaluation structures and to the nature of the conferencing environment itself, as well as the negative student attitudes which partially resulted from these problems, caused the study to be something less than a fair test of the worth of software-based peer evaluation structures. In fact, these shortcomings would have raised serious questions about the trustworthiness of even a very positive result. As it stands, one can only recommend that alternative designs and implementation conditions (including the use of software with fewer shortcomings than CoSy) be tested before CMC peer evaluation structures are either adopted in educational practice or removed from the current research agenda.

Rejection of the first hypothesis automatically resulted in a similar fate for the second hypothesis, since the latter

necessitated at least the presence of significant differences among treatment groups (with respect to the quality of student work, the primary dependent variable). Whether or not enhanced feedback conditions in a CMC environment lead to additional gains in performance over time, when compared to more rudimentary feedback arrangements, is therefore another question to be addressed by future research.

The third and final hypothesis, which more specifically addressed the quality of peer ratings carried out via the evaluation structures, was also not confirmed. Student ratings did not improve in quality over time, when measured against those of independent evaluators. Furthermore, there was no evidence to support the subsidiary hypothesis that enhanced feedback conditions in the second experimental group would lead to better-quality peer evaluations.

Based on the results of this study, it is clear that one could not recommend the widespread implementation of peer evaluation structures as designed and used in the present context. Nevertheless, the exercise did generate some valuable information on several fronts. First, the experiment confirmed the existence of significant problems in educational computer conferencing related to quality and feedback and uncovered the beginnings of potential solutions. Secondly, the results of the study (both expected and unexpected) point to some interesting new research directions in educational CMC which could be more fully considered and exploited. Finally, experience acquired through all phases of

the project highlights the special problems and opportunities which characterize research with this particular medium; such information may help other researchers to design better studies, to carry them out under more favourable experimental conditions and thereby with better chances of success.

Confirmation of Feedback and Quality Problems

With respect to the feedback limitations of computer conferencing, students who took part in the study were in general agreement that at least some form of acknowledgement is necessary once a message has been added to an on-line conference. Subjects in all groups felt that feedback (taken here to mean qualitative or quantitative responses to contributions) was important, but was not given in sufficient quantity or regularity. Since it is not reasonable to expect that every message will be commented upon by all members of a conference, acknowledgement is a minimal form of response which would at least let the author of a message know that her contributions were not being ignored. This could be concretized by means of a very simple rating scale such as the one described earlier, combined with a very simple way (completely automated if possible) of feeding back this acknowledgement to the author of a message in a timely manner.

Acknowledgement does not, however, deal with anything more than the simple absence of responses from peers and instructors. More importantly, students taking part in this study made it clear that they expect comments and evaluations

of their on-line work to be of high quality. This is of course what the peer evaluation structures were intended for, in addition to effectively removing the concern regarding unacknowledged messages. Their design reflected what was thought to be an efficient and practical way for participants in educational group work to carry out and communicate thoughtful evaluations of peers' contributions, in the presumed safety of anonymity. Granted, the evaluation features suffered from several design- and context-related shortcomings (already discussed in considerable detail), but the speed with which some students abandoned their use contradicts the apparent concern for quality just mentioned. Similarly, there was little or no evidence of students keeping the three dimensions of quality in mind while commenting on the work of peers. This is somewhat distressing, but is perhaps symptomatic of a general overestimation of university students' attitudes and abilities with respect to thinking, even at the graduate level. Critical evaluation, synthesis, or even summarizing of information are intellectual skills which are not as widespread among the university student population as we would all like to think. This is likely especially true in programs with a strong professional orientation, such as educational technology, where official certification is a high-priority goal and many students complete courses while working full-time. Hence, endeavours aimed at establishing and reaching higher standards of quality in student work will not always be welcome, particu-

larly if the additional effort required of students has no obvious grade-related payoff. While this will be seen by some as a cynical and pessimistic view, many would agree that quality-related problems in educational CMC are simply a reflection of a much broader "problem" in education as a whole. This particular medium poses some special problems, in part because its users tend to generate large quantities of information which is also more public than educational transactions usually are, so low quality becomes more evident. But the medium also has characteristics which facilitate the remediation of quality problems, this study being an example of an attempt to do so.

The foregoing discussion regarding the prevalence and depth of the "quality problem" simply serves to underline that by itself, the implementation of software-based peer evaluation structures cannot be expected to significantly improve the quality of on-line student work over the course of a semester. This requires a determined effort on several fronts, including explicit training and modeling of the target skills and attitudes, as well as software enhancements which are labour-saving, rather than labour-intensive. The latter can be used to support and reinforce the conditions created by human interventions but cannot be expected on their own to create an environment where reflection and excellence are valued.

Implications for the Content of Future Research

In terms of future research possibilities, it would be most interesting (after having dealt with the shortcomings of the present attempt) to follow up on the above claims and test the relative importance and potential synergistic relationship between training/modeling and software support approaches to peer evaluation in a CMC envi ent. Additional dimensions of the problem could be explored with the introduction of variables related to: student versus software control of peer evaluation mechanisms; conferencing software characteristics (e.g., indexing features, etc.); instructional task characteristics (e.g., subject area, individual versus cooperative work, design versus analysis task, etc.); and finally, the characteristics of students, such as learning style, which Lundgren-Cayrol (1989) considered in a recent preliminary investigation carried out at Concordia University.

In the above-mentioned study, it became apparent that there was a fairly clear distinction between those participants who tended to evaluate and respond to their peers' messages rather promptly (therefore choosing not to bother with uploading and downloading) and those who preferred to read, "digest" and compose contributions in a more leisurely fashion, thereby really exploiting the advantages of asynchronous electronic communication. Quinn (1983) reports a similar separation between those subjects who thought that the time delay in electronic discussions made it difficult to

understand the material, and those who had an opposite reaction to the temporal factor, claiming that "the time separation allowed reflection and time to compose a coherent answer" (p. 320). This apparent differentiation of subjects into two quite distinct groups was also noticed in the present study, and represents a potentially important topic of future research. While it would be a simple solution to suggest that CMC is a medium for the reflective and that the impulsive should stick to synchronous media, ways need to be found to make computer conferencing an effective medium for all kinds of students and for even the most demanding educational tasks.

Implications for the Process of Future Research

Once this study was finally completed, only one recommendation to other researchers came to mind: Don't do it! This rather negative attitude came about as a result of difficulties caused in part by the particular circumstances of the project and in part by factors common to many CMC research efforts. In the former category was the very much underestimated effort required to carry out fairly substantial modifications to the CcSy software. The software was considerably more complex than imagined and not particularly well documented. Furthermore, the computer resources required to effectively modify, compile and test the trial version of the conferencing system, while running and managing the original version for an active user population, were not always available to the member of the project team carrying

out the modifications. The more general category included difficulties related to the following:

- training users, who for the most part are completely unfamiliar with computer conferencing and electronic mail, to quickly get "up to speed" and competently use a system which, after the semester is over, they probably will never use again;
- training users in the use of two additional software packages (communications software and a text editor) because conferencing software must be accessed to be used and usually resides on a mainframe computer with less than adequate text editing facilities;
- providing access to a sufficient number of micro-computers and dedicated phone lines for those students without their own equipment;
- providing technical and other support (usually at a distance), getting laggard users up and running, encouraging the proper use of system features, etc. without the benefit of the infrastructure which becomes necessary when conferencing systems are implemented in educational institutions;
- keeping up with student interactions and providing high-quality moderation of conferences so that those who have caught on will not lose interest or become discouraged.

These difficulties were for the most part overcome in the present study, some better than others, as was discussed in previous sections. Since the difficulties mentioned

increase geometrically with the number of students involved, the relatively small number of subjects taking part in the experiment made things easier than they could have been, on a strictly logistical level. Of course, the small size of the treatment groups was more of a liability in research terms since very large treatment effects would have been necessary for statistical analysis to yield significant differences.

This obvious trade-off between logistical manageability and the adequacy of research conditions cautions against undertaking CMC research without prior careful consideration of the costs and benefits (so "Don't do it!" translates to "Don't do it lightly!"). As a general rule, it is probably not wise to mobilize all the resources necessary for this kind of research for the purposes of only one or even a few experiments, however important or interesting they might seem. To have good chances of success, educational CMC research requires commitment at least on the scale of an academic department or programme. A single faculty member will usually have considerable difficulty generating the financial resources necessary to purchase and maintain conferencing software, and to hire and train the personnel required for research, which includes a system manager and/or developer, research assistants and tutors (the latter being responsible for user training, moderating and student support during the course of research). Furthermore, when only one person makes use of the medium in a department, the subjects of studies carried out are almost always neophytes, since

students do not have the opportunity of becoming familiar with CMC in courses taught by other faculty. This maintains an unfortunate situation in which potentially very interesting experiments are dragged down by very uninteresting factors related to knowledge of the software and hardware, confidence with the conferencing process, and so on. It is indeed difficult to seriously address the central educational questions of CMC research in such a context.

It goes without saying that implementing computer conferencing department-wide for research purposes means using it in educational and administrative practice as well. This is a benefit which, for academic organizations which are ready and willing to exploit it, can be quite significant (it does require, however, for members of the organization in question to be already equipped with hardware and already communicating with each other on a regular basis - CMC then serves to make these communications more efficient). It also opens up new avenues in the realm of distance education for departments traditionally limited to on-campus offerings, and makes possible important improvements in student support and other communications for organizations already involved in distance education.

CMC research has other advantages as well, not the least of which is the automatic generation of a permanent computerized record of all transactions taking place during the research process (Hiltz & Turoff, 1978), making possible the use of automated analysis tools. Such a record makes of the

medium not simply a good subject of research, but also an excellent vehicle for research on a number of other educational issues, practices and theories. Other positive aspects include: the relative flexibility and wide applicabilitiy of the medium, when compared to other computer-based educational tools such as CBT, IVD and so on; the significant body of research which already exists, produced by a well-networked group of researchers; and the international scope of research and practice. Finally, the current and future relevance of CMC research is undeniable, particularly as educational technologists begin to rediscover the collective dimension of even media-based training and education. Moreover, as the convergence of computer and telecommunications technologies progresses and CMC software interfaces and capabilities improve, no educational institution will be able to avoid providing computer conferencing or similarly oriented services and facilities to its students, be they on or off campus. It is important for us to learn how to do it with optimal effectiveness and efficiency.

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Appendix A

Instructions to Students: Cybernetic Modeling Project Guidelines

PHASE 1: SELECTION OF FOCAL SYSTEM

1.1 It must be a real system in which you have worked or in which you have been a learner.

1.2 It should be a knowledge/skills/values development system, which has been used by you to learn or teach something, or manage learning (FIRST-HAND knowledge is essential).

1.3 It should be of sufficient complexity to be somewhat unpredictable, large enough but not too large (e.g. the Québec education system is too large), small enough but not too small (a system where someone learns to subtract one-digit numbers is too small).

1.4 It should be one you can talk about realistically without getting fired or divorced, etc. (e.g. not the Ed. Tech. graduate programme!).

(Make a choice and give your reasons for the choice in no more than two screens on CoSy in your group's modeling conference.)

PHASE 2: IDENTITY AND OWNERSHIP

2.1 State your role in the focal system.

2.2 What is/was your main expectation for its role?

2.3 State your main aspirations in and for the system.

2.4 State your main anxieties about the undertaking.

2.5 Name the other principal actors (pseudonyms or titles). (Keep in mind here the distinction made by Pask between "m" individuals and "p" individuals).

2.6 What are/were the main concerns/aspirations and anxieties of the other main actors?

2.7 What goals have been publicly identified and/or negotiated for the focal system?

2.8 Who benefits most from this system (e.g. clients, sponsors, participants, etc.)?

2.9 Who bears the main present and future costs (including opportunity costs)?

PHASE 3: CONTEXT AND ENVIRONMENT

Purpose: Here the point is to find out those aspects of your system's ENVIRONMENT and CONTEXT which crucially affect its viability and health.

3.1 State which supra-systems your focal system is part of (make a diagram of its environment if you think that will help).

3.2 Indicate the boundaries of your f/s with respect to each of the supra-systems (possibly at the limits of your own direct influence?).

3.3 State the main resource inputs (forms of nourishment) which each supra-system provides.

3.4 State the main outputs (if any) which your f/s gives/sells etc. to supra-systems (good or desired outputs!).

3.5 State the undesired inputs from the environment - forms of noise, interference, attacks, etc.

3.6 State the undesirable outputs of the focal system?

3.7 MOST IMPORTANTLY: Indicate/describe any reward-punishment or accountability feedback loops out in the environment which link the outputs of the focal system back to critical inputs. Are they deviation-AMPLIFYING or deviation-LIMITING or both?

3.8 STATE THE MAIN SOURCES OF CONTROL from the supra-systemic environment (they probably involve the loops of 3.7).

PHASE 4: INTERNAL STRUCTURE

Purpose: Exhibit the internal component/channel structure of the focal system (the very slowly changing connecting and processing elements). This phase can be somewhat freer since there is quite a range of focal systems, and also you now have your feet wet. The main things here are: structure and autonomy.

4.1 Diagram the main production or personal performance units (subsystems) and how the feed each other (an ordinary flow diagram will do).

4.2 Show the input/output and control hierarchy among the sub-systems, and the heterarchy if it exists (heterarchy exists when a production unit is partly controlled by several others, each having a span greater than it (i.e. a span of two or more). Are Stafford Beer's five viability-ensuring sub-systems present?

4.3 Exhibit redundancies and parallelisms (good and bad - good redundancy means simply having back-up in case you are overloaded, etc.).

4.4 Which of Helmar Frank's main classes of variables are present and important in the focal system (goals/purposes, psychostructure, sociostructure, media, content, control algorithms/heuristics, RULES OF THE GAME).

4.5 Show the pay-off matrix, if any.

4.6 What deviation-limiting control loops and norms or standards are directly involved?

4.7 What deviation-amplifying loops exist around and within this sub-system?

4.8 What disturbance variety (noise, disruptions, attacks) does it suffer?

4.9 What control/mutual control variety (ventures, strategies, tactics, etc.) does it have?

PHASE 5: BEHAVIOUR AND VIABILITY

5.1 How does/did the focal system behave over a cycle or term of operation? (Can the behaviour of the two most important variables be plotted over the time frame you have chosen?)

5.2 Is/wass the performance of the whole system and all its main sub-systems satisfactory? To whom?

5.3 Is/was there requisite variety? Does/did the control variety adequately match the disturbance varieties?

5.4 Are the closings and openings sub-optimal?

5.5 SENSITIVITY ANALYSIS - which times and places and variables are most sensitive to intervention? Where would/do the smallest interventions have large effects?

PHASE 6: PRESCRIPTION

6.1 How can the system be improved (split it, enlarge it, add or remove loops, add variety, remove noise, add or resolve conflict, etc.)?

6.2 By whom? (Obtain commitments!)

6.3 When?

Appendix B

Instructions to the Control and Experimental Groups

NOTE: In what follows, the annotation in the left margin indicates to which group(s) the particular instructions were given (ALPHA = Experimental group 1; BETA = Control group; GAMMA = Experimental group 2 -- see Method section for details on treatments). The messages are excerpts from the CoSy transcripts.

ALPHA ==========
BETA projinfo3/general #1,tutor, 572 chars, 3-Oct-89 20:34
GAMMA ----------

= 1. INTRODUCTION =
==========

Please read the following information carefully. If you have any questions about any of it, do not hesitate to contact Jacques or Gary by conventional means, OR preferably, put your question in conference "projinfo3". This information is also contained in that conference.

** IMPORTANT NOTE **: TO AVOID "CONTAMINATION" OF THE EXPERIMENT, PLEASE REFRAIN FROM DISCUSSING YOUR CoSy PROJECT WORK WITH FELLOW STUDENTS OUTSIDE OF THE CoSy ENVIRONMENT ITSELF.

*** YOUR COOPERATION IS GREATLY APPRECIATED.
***

ALPHA ==========
BETA projinfo3/general #2,tutor, 1543 chars, 3-Oct-89 20:35
GAMMA ----------

= 2. TIMELINES =
==========

As you know, the modeling portion of project work on CoSy officially begins tonight, October 3, 1989. By now, you should have selected a focal system to model, and received comments on your selection.

Modeling work will be carried out for an 8-WEEK PERIOD, due to end on November 28, 1989. This period will be divided into 5 phases, corresponding to Questions 2 to 6 in the handout you received previously. The tentative schedule will be as follows (NOTE: this schedule is slightly different than the one proposed in class on September 26):

PHASE	CONTENT	START	FINISH
1	Selection of Focal System	COMPLETED	
2	Identity and Ownership	October 3	October 17
3	Context and Environment	October 17	October 24
4	Internal Structure	October 24	November 7
5	Behaviour and Viability	November 7	November 21
6	Prescription	November 21	November 28

ALPHA ==========
BETA projinfo3/general #3,tutor, 1401 chars, 3-Oct-89 20:36
GAMMA ----------

= 3. CONTENT OF THE PHASES =
==========

The specific content you are required to cover for each phase of the project has already been identified in your class handout. However, at the beginning of each project phase, we will put the exact requirements for that phase in a message in this conference (for example, the last message in this conference right now - October 3 - includes the particular requirements for Phase 2; in two weeks, we'll put in the requirements for Phase 3, and so on).

We are doing this for two reasons:

1. since this is a new format for ETEC 606, there may be some re-organization or re-ordering of the project requirements as work progresses (therefore, the class handout should be seen as a preliminary guide to the project, to be ironed out);

2. we wish to encourage you to work always on the current phase of the project, and to not try to jump ahead to later phases. Since you'll be working in a group environment, we would like to think that you will be sensitive to the comments and critiques of your peers, and adapt your work accordingly. You can only do this by working at the same pace as the rest of the group.

NOTE: Rest assured that although an experiment is going on, ALL class members have to cover the same CONTENT. There are NO differences between the three groups in this respect.

ALPHA ==========
BETA projinfo3/general #4,tutor, 1445 chars, 3-Oct-89 20:37
GAMMA ----------

= 4. PROJECT CONFERENCES AND TOPICS =
==========

The project CONFERENCES are called "alphabits", "betabits" and "gammarays". They correspond, quite evidently, to the three conferences already set up for purposes of selecting focal systems. As before, you have been made a member of the appropriate conference, so it will show up with its new messages when you log on.

Each project conference contains a number of project TOPICS, each corresponding to an individual student project. If you have given us a preferred name for your personal topic, you will find it under that name. Otherwise, you will find it under the name that we have assigned to it (it will be easy to find, since the first message of each topic gives a quick description of the project in question).

All of your personal project work should be entered in your topic. All ideas, comments and critiques regarding OTHER PEOPLE's work must be entered in THEIR topic. PLEASE MAKE SURE THAT YOU ARE IN THE APPROPRIATE TOPIC BEFORE USING THE "say" OR "comment" COMMANDS. If you're not sure, type "1 <CR>" to display the first message; this will avoid confusion and save time otherwise spent moving messages to their correct place.

ALPHA NOTE: All messages related to either your own or other
GAMMA students' projects should be entered using your REGULAR ID, as you've already been doing. The ANONYMOUS ID's will not be used.

ALPHA ==========
BETA projinfo3/general #5,tutor, 1880 chars, 3-Oct-89 20:38
GAMMA ----------

= 5. GUIDELINES FOR PARTICIPATION =
==========

For each of you, project work on CoSy will involve two equally important elements. First, you will be required to ANSWER the questions included in each phase, for your OWN project topic (see evaluation criteria below). Secondly, you will be expected to COMMENT constructively on the answers of OTHER students. This is meant to include evaluative comments, positive OR negative (again, see evaluation criteria below), as well as suggestions for improvement, requests for clarification, and so on.

While we do not wish to impose rules for your participation, here are some guidelines to keep the exercise running smoothly:

- during the project period, get on CoSy at least once every two days, to put in ANSWERS or COMMENTS. Avoid cramming all your participation into the last day or two of the current project phase. This only deprives you of the valuable feedback you could be receiving from your peers, and does considerable harm to the group learning environment;

- say enough in your messages to make your point(s), but do your best to limit them to BETWEEN 1 AND 2 SCREENS in length. If necessary, split a longer answer into two or more messages;

- comment REGULARLY on answers put in by other students, and try to make your COMMENTS as substantive as your ANSWERS (i.e. "I think XXX's answer is really good" would not be considered a substantive comment!);

- lastly, and perhaps most importantly, take your time THINKING ABOUT and COMPOSING your answers and comments, however short they may be. As much as possible, use the CUTE editor and upload your messages later. After all, time for reflection is one of the advantages of computer conferencing over traditional forms of educational communication.

ALPHA ==========
BETA projinfo3/general #6,tutor, 1161 chars, 3-Oct-89 20:39
GAMMA ----------

= 6. EVALUATION CRITERIA =
==========

Your contributions to the 606 modeling project exercise (answers AND comments) should be created with the following dimensions of quality in mind (with respect to your own AND others' work):

a) DEPTH: refers to the depth of knowledge demonstrated about the system component being described or analyzed and, if the question requires it, about cybernetic ideas, concepts or principles. Also refers to the depth of analysis of other people's work;

b) ORGANIZATION: refers to the structure of an answer or of a comment. It should be easy to follow and logically organized;

c) CREATIVITY: refers to the originality of the ideas expressed in answers or comments, and to other creative abilities demonstrated (drawing analogies, looking at something from a different perspective, combining things to create something new, and so on).

Your project grade will be based on the degree to which your contributions (answers and comments) reflect these dimensions of quality AND on the degree of improvement over the course of the project period.

ALPHA ==========
GAMMA projinfo3/general #7,tutor, 1215 chars, 3-Oct-89 20:50

= 7. SPECIAL CoSy EVALUATION FEATURES =

Some new features have been added to CoSy for purposes of your project work. These are intended to support peer evaluation. Here's how they work. (NOTE: AS BEFORE, IF YOU GET LOST AT ANY POINT WITH THE NEW FEATURES, TYPE "?" TO GET A LIST OF AVAILABLE COMMANDS).

When you get into any topic in the project conference, you will see a new prompt: "Read-Eval", which replaces the now familiar "Read:" prompt. Typing a <RETURN> here will display the first new message (as always), but once you get to the end of it, you will NOT proceed to the second new message. Instead, another new prompt will be displayed: "Eval/Action:" (signifying "evaluation action"). At this point, you will have the following choices, as follows:

? or h	This will give you a listing of available commands (similar to this list).
eval (e)	Evaluate the message.
quit (q)	Do not evaluate message now; go back to Read-Eval prompt and evaluate message later.
read (r)	Read the same message again.
abstain (a)	Do not evaluate the message; if you use this command you CANNOT evaluate the message later.

ALPHA ==========
GAMMA projinfo3/general #8,tutor, 1338 chars, 3-Oct-89 20:51

= 7. SPECIAL CoSy EVALUATION FEATURES (cont'd) =
==========

If you type in "e <CR>" to evaluate the message, CoSy will present you with the three evaluation dimensions described in the previous section, one at a time. It will look like this:

Please evaluate the message on the following dimensions:

----> depth (1 to 10): (here, type in a number or "?" to get a short description of the dimension and its scale)
----> creativity (1 to 10): etc. etc.

When you have rated the message on all three dimensions, CoSy presents you with the "eval - add/action" prompt. Here, the following choices are available:

? or h	Get a listing of available commands.
add (a)	"Add" your evaluation.
edit (e)	Edit (change) your evaluation.
quit (q)	Do not add the evaluation; go back to Read: prompt.

GAMMA If you "add" the evaluation, CoSy displays the header of the message you just evaluated, complete with the average of all the evaluations done on that message so far.

ALPHA At this point, you can make a written comment on the
GAMMA message if you wish (by typing "com", as always). These written comments (evaluative or otherwise) remain an important part of your work.

ALPHA ==========
GAMMA projinfo3/general #9,tutor, 1522 chars, 3-Oct-89 20:52

= 8. IMPORTANT POINTS RE. THE EVALUATION FEATURES =
==========

- you are STRONGLY encouraged to evaluate all messages contributed by other students (and, if you wish, those put in by the instructor and tutor(s) too!). AS MUCH AS

POSSIBLE, AVOID USING THE "ABSTAIN" COMMAND, UNLESS IT REALLY APPEARS IRRELEVANT TO EVALUATE A PARTICULAR MESSAGE (e.g. messages like "Yup!"). Evaluation using these features is a short procedure, but do it carefully. Remember that you are providing performance feedback to one of your peers.

- the evaluations you will carry out with these features are anonymous, i.e. the author of the message being evaluated only sees the average of all the evaluations, and no names are attached.

- the evaluation features have been designed in such a way that you cannot "read" a new message in the project conference UNTIL YOU HAVE EVALUATED THE PREVIOUS MESSAGE (i.e. evaluations have to be done promptly).

- however, you can type "file new" to put all new messages into the scratchpad, which you can then download. You can then read the new messages at your leisure, and decide how you will evaluate and comment on them. When you get back on CoSy, you will then formally evaluate the messages, one at a time.

- note down the message numbers of your OWN contributions to the mid-term conference. When you type in these numbers later, you will see how others have evaluated your answers and comments.

ALPHA ==========
GAMMA projinfo3/general #11,tutor, 247 chars, 11-Oct-89 00:36

TITLE: Reviewing the evaluations of your messages

Remember, if you wish to see how your own messages are being evaluated, try typing "header 1 to last". This will display just the headers and titles and evaluation totals for previous messages.

ALPHA ==========
BETA projinfo3/general #12,tutor, 577 chars, 11-Oct-89 22:27
GAMMA ----------

TITLE: Length of messages...

While we were very clear about the maximum length of messages (1 to 2 screens), we didn't feel the need to specify a reasonable MINIMUM length! However, there is a risk of a cumbersome number of messages if every single point you cover (e.g. your role, role of other actors, etc.) takes up 1 message.

Don't worry about grouping several points together in one message, as long as the total length isn't longer than the maximum suggested. But of course, in all cases, use your judgment to decide on the best organization of your contributions.

BETA ==========
projinfo1/general #8,tutor, 1190 chars, 3-Oct-89 20:04

= 7. ANONYMOUS ID'S =
==========

When making comments on other people's contributions, you may sometimes wish to be anonymous. Since you already have an anonymous ID (it's written on the inside of your Procomm/CUTE diskette pouch), complete with the required log-on files in your dialing directory, then simply feel free to use this anonymous alternative whenever you want to make an anonymous comment.

If you want your anonymous ID to remain anonymous, however, avoid using it when making contributions about your own project, since people will already know who is working on what topic.

Remember that when you get on CoSy with your anonymous ID, CoSy will consider you a separate user and thus won't take into account all the messages you have read previously with your regular ID (i.e. CoSy will try to display ALL the previous messages to you). So while still logged on with your regular ID, note the number of the message(s) you wish to comment on anonymously. Then, after logging off and logging back on with your anonymous ID, you will simply have to join the project conference and topic desired, and type "comment 54 <CR>" or whichever message number you want.

Appendix C

Post-Experimental Attitude Questionnaire

ET 606 COMPUTER CONFERENCING STUDY
NOVEMBER 1989

PARTICIPANT QUESTIONNAIRE

YOUR GROUP (circle one): ALPHABITS BETABITS GAMMARAYS

NAME: _____

General Perceptions

For the following, circle the number which best reflects your feeling about the statement.

1 = STRONGLY AGREE -- 5 = STRONGLY DISAGREE

The use of computer conferencing in ET 606 was a key element in a superior learning experience.	1	2	3	4	5
The use of computer conferencing requires more effort on the part of students than traditional instruction.	1	2	3	4	5
I would register for another course requiring the use of computer conferencing as a learning medium.	1	2	3	4	5
The reference documentation, training workshops and on-line or telephone support were adequate.	1	2	3	4	5
I had sufficient access to reliable equipment to do my computer conferencing work when I wanted to.	1	2	3	4	5

Comments: _____

Details re. Participation

How OFTEN did you get on CoSy to read messages and/or to add your contributions/comments (on the average)? _____

How do you feel about the AMOUNT OF TIME you spent on your computer conferencing activities (circle one)?

NOT ENOUGH **ABOUT RIGHT** **TOO MUCH**

How often did you download other people's messages in order to have more time to read them (circle one)?

ALMOST ALWAYS **SOMETIMES** **RARELY OR NOT AT ALL**

How often did you upload your messages, after having composed them when you were not on CoSy (circle one)?

ALMOST ALWAYS **SOMETIMES** **RARELY OR NOT AT ALL**

Comments:_____

_____

_____

Details re. Feedback and Evaluation

Rate the overall QUANTITY of feedback you received from other students.

NOT ENOUGH **ABOUT RIGHT** **TOO MUCH**

Rate the overall QUANTITY of feedback you received from the instructor & tutor.

NOT ENOUGH **ABOUT RIGHT** **TOO MUCH**

Rate the overall QUALITY of feedback you received from other students.

SUPERIOR **ADEQUATE** **INADEQUATE**

Rate the overall QUALITY of feedback you received from the instructor & tutor.

SUPERIOR **ADEQUATE** **INADEQUATE**

Rate the overall TIMING of the feedback you received from others.

GOT IT WHEN I NEEDED IT **GOT IT TOO LATE**

Rate the IMPACT of the feedback you received on the quality of your work.

LARGE IMPACT **SOME IMPACT** **LITTLE IMPACT**

Comments:_____

_____

Details re. the CoSy EVALUATION features (**alphabits & gammarays only**)

Rate the IMPORTANCE FOR LEARNING of the evaluation features.

VERY IMPORTANT SOMEWHAT IMPORTANT UNIMPORTANT

Rate the QUALITY OF THE DESIGN of the evaluation features (please make comments below).

HIGH MODERATE LOW

Rate the ACCEPTABILITY of the EFFORT required by the evaluation features.

TOO MUCH BOTHER ACCEPTABLE ENJOYED IT

Rate the USEFULNESS of the evaluations you received on your messages.

VERY USEFUL SOMEWHAT USEFUL USELESS

Rate the USEFULNESS of seeing the evaluations of OTHER PEOPLE's messages (**gammarays** only).

VERY USEFUL SOMEWHAT USEFUL USELESS

How often did you use the evaluation features to rate other people's messages (i.e. how often did you NOT abstain)?

ALMOST ALWAYS SOMETIMES RARELY OR NOT AT ALL

Would you recommend the continued use of the evaluation features in future courses?

YES ONLY WITH CHANGES (SEE COMMENTS) NO

Comments:_____

_____

_____

Appendix D

Record of Peer Evaluation Software Modifications

(Note: The following are excerpts from mail and conference exchanges between Dimitri Kourkopoulos ['cosymgr'] and Jacques LeCavalier ['tutor']).

Memo #1112
From: tutor
Date: 6-Nov-88 18:15
To: cosymgr
Subject: Evaluation mods

Dimitri,

Here are a few more thoughts regarding the evaluation features, which we could discuss further in the next few days:

* a disadvantage of forcing the evaluate feature on users which I mentioned in the original specs, is that they would be forced to evaluate their own messages too. (The 'unread' flag is active for one's own messages, isn't it?)

* we had thought it possible to permit users to "file" new messages if they didn't want to evaluate them immediately. But is there a way to file only the new messages in a conference before having read them (ie. "file new")? You would have to know the message numbers, which would mean doing a bit of arithmetic based on the header information (eg. "3 new messages of 25"). As simple as this may be, I'm almost sure it would cause big problems in terms of user acceptance.

* if we are going to force the evaluate feature in a particular conference or topic, is there a need to have both an "unread" flag AND an "unevaluated" flag. Why not just have one flag which is switched off when the message is both read and evaluated (ie. the message remains "new" until then). Users would be alerted to this kind of topic when they join, just like in a "read only" topic: THIS TOPIC IS READ AND EVALUATE.

* here's my current idea for the interaction:

Read: join class disc
Joining conference class, topic discussion, 1 new message of 45
THIS TOPIC IS READ AND EVALUATE
Read:

```
================
class/discussion #45, whites, 999 chars, 30 Nov 88 12:43
This is a comment to message 39
----------------
blah blah blah
blah blah

Please evaluate this message on the following
dimensions:
CLARITY, RELEVANCE, ORGANIZATION < 1 (lo) to 5 (hi) >:

CLARITY: 3
RELEVANCE: 4
ORGANIZATION: 3

Thank you! No more unread messages in this topic.
Press <RETURN> for next active conference/topic.

Read:header 45

================
class/discussion #45, whites, 999 chars, 30 Nov 88 12:43
This is a comment to message #39
4 evaluation(s) to date: CLARITY 4; RELEVANCE 4; ORG'N 3
----------------

No more unread messages in this topic.
Press <RETURN> for next active conference/topic.

Read:
```

....Now that I think of it, I suppose a fair amount of work would have to go into making the feature robust to inappropriate input and so on (numbers other than 1 to 5, etc. etc.).

I'll give this some more thought over the next few days. We'll also have to figure out the data collection and display features (I'll bring a copy of the HUB monitor stuff tomorrow, which I mentioned last Thursday).

Salut! Jacques

Reply from cosymgr, 11 Nov 88:

concerning the points you raise....:

* I had a meeting with Gary a couple of days ago, and he decided that forcing an evaluation is a good thing. I can get around the problem of someone being forced to evaluate themselves; when the user creates a message in an EVAL conference/topic the message can be considered as evaluated as well. However, Gary felt that it may be good for the user

to evaluate their own stuff...so for now we're going with that.

- forced evaluation, including user's own messages
- no re-evaluations permitted
- read messages may be re-read

* Two pointers will still be needed: one to keep track of evaluated messages (which cannot be reset or modified in any way by the user); and another to keep track of read messages (the user can modify this one by using the skip command).

* We both agreed with your suggestion of a file new command. It would be very useful. Only problem is that when you do a file command on unread messages, CoSy considers them read. Thus to remain consistent with the forced evaluation characteristic the file new must be limited to the next unread message. How about another command called file next?

* The routines would have to check for incorrect and out-of-range inputs by the user.

* The interaction you gave looks good. Two other types of inputs should be permitted: a quit anywhere, which cancels the current evaluation; and a ? which gives descriptions of the available commands and the meaning of the dimensions.

Dimitri

Reply from tutor, 13 Nov 88:

Hi Dimitri,
Thanks for your comments on my previous message. And back over the net to you!

* I remain in disagreement about the self-evaluation thing, for two reasons: 1) as mentioned in the class discussion last week, I think the RECEIVER of a message should be made to work a little harder, but the SENDER is already doing enough by taking the time to submit something to evaluation by others; it's asking too much to force self-evaluation on participants too. 2) some of the literature I've read about the effects of monitoring on performance suggests that the positive effects on performance are NOT dependent on whether monitoring is external or internal (i.e. implicit self-evaluation will take place anyway as a result of external monitoring, so explicit self-evaluation appears redundant). It would be ok to make self-evaluation POSSIBLE, but I suggest that it be excluded in the default condition.

* Too bad about the two-pointer thing. I never considered the skip command (nor do I ever use it!). That command is intended for Johnny-come-lately users who wish to avoid reading all the early messages in a conference, isn't it?

Since there would be no such users in our eval conferences, do you think it would be a good idea to disable it? Is it possible to do only for selected conferences?

* the file next idea makes sense, IF we are stuck with two pointers. (A user wouldn't be able to "batch"-file new messages, because the evaluated pointer would "stick" after every message.) However, with the skip command disabled and with only one read & evaluated pointer, file new wouldn't trip any flag, and evaluation would be forced in a more subtle (and more easily implemented?) way. New messages would simply pile up, and the user would find it necessary to re-read and evaluate earlier messages in order to easily remain up-to-date in the discussion. I think this would be sufficient incentive for users to evaluate messages promptly, and would probably result in a simpler and more flexible mod, closer to the look and feel of other CoSy features. Qu'en penses-tu?

* Again, with the quit command: with two pointers, when a user quits an evaluation in progress, the read flag is now "on" but the evaluated flag remains "off". So the only option he has is to file the message in question and get out of the topic it's in (since he won't be allowed to read the next message). When he's ready to evaluate it, he'll return to the topic but will have to find the message by its number, the read flag having been tripped. With only one pointer, on the other hand, the user won't be forced to exit the topic. He'll be allowed to look over the new stuff and perhaps file it only after this preliminary scan. When he returns to the topic with the intention of evaluating, the first message to evaluate will come up automatically, thus simplifying the process of read/ponder/evaluate, which should be encouraged.

Jacques

Memo #1153 in reply to Memo 1147
From: cosymgr
Date: 15-Nov-88 11:04
To: tutor
cc: boydg dimitrik picotj cosymgr
Subject: Evaluation mods

Since forced evaluations are deemed necessary something else must be considered. It was mentioned at our first requirements meeting: what about users who are merely observing the progress of the conference (i.e. not involved in the evaluations)? Such 'observers' may be important; they should *not* have to evaluate.

One easy (and I believe necessary) solution is to permit a 'null' or 'abstain' value, say 0 (zero). Thus in any EVAL conf/topic the evaluation range is between 1 and n (where n

is set by the moderator), and 0 is the null value. If a 0 is given to the first eval-dimension, then the message is considered evaluated (albeit abstained). Abstained evaluations are not used in the statistics.

I can also use this to remove self-evaluations. Whenever a user adds a message to an EVAL conf/topic, a zero is automatically given to each eval-dimension. Thus the user is spared the self-evaluation, and can go on to the next message.

Dimitri

Memo #1154 in reply to Memo 1133
From: cosymgr
Date: 15-Nov-88 11:42
To: tutor
Subject: Evaluation mods

I've been thinking about the skip and file commands. They're not the only ones that will need some restricting in EVAL conf/topics. This is partly in response to the questions in your mail message.

I've covered the problem of self-evaluation in another letter, so here's the other stuff. We should put this stuff in a conference.

Now, about the two-pointer thing. There is no need to disable the skip command. It will be easier to work it with two pointers. Besides, I don't want to change its functionality. However, in the case of "skip to last", last will mean the next (read or unread) unevaluated message. "Read last" and "file last" must also have to be treated in the same fashion.

The "file new" in an EVAL conf/topic will behave like a file next; see what I mean? I want to maintain the functionality of both forced evaluation (one message at a time) and the file new command. The user will type "file new" and (if there are new messages) the very next unread and unevaluated message will be FILEd. Otherwise, the command will fail.

Quiting an evaluation (message read but not evaluated), won't be a problem. The user may still reread it later on, or file it using its number.

Finally, with the above considerations, it won't be necessary to display the next read but unevaluted message when a user rejoins the conference. He or she could use read-last, skip-to-last, file-last, etc. This way the basic functionality of the read mode isn't altered too much.

In summary, in an EVAL conf/topic, it is important to distinguish between (un)read and (un)evaluted messages--four different conditions in total. Also it is important to maintain as much of the functionality of the CoSy system commands, while adding our own requirements.

Dimitri

==========
cosy.specs/requirements #8,cosymgr, 2301 chars, 27-Nov-88 21:07
Comment(s).

Some more points :

1. The withdraw command will be permitted. Evaluations already done on the withdrawn message will be discarded. (After all, since the message text is no longer available, what good are evaluations on it?)

2. The evaluation feature will be available only at the conference level (not topic). This is the only way to insure controlled evaluations (with respect to conference participants). Every topic within the conference will be an evaluable one. In order to maintain control (and prevent malicious inputs from outsiders) EVAL confs are by default closed. Finally, in the "sh all" command EVAL confs will be indicated by an 'e' symbol.

3. The following CoSy commands and keywords will have restricted application (to maintain the forced evaluation requirement):

<RETURN>
file
search
skip
header
(to) <msg#>
<msg#> to <msg#>
(to) last
all
new

The forced evaluation rule is that a message must be evaluated before the next one may be seen (read) and evaluated. Messages may not be re-evaluated. The sequence of messages in a conf may be considered as follows: a number of evaluated ones, followed by the pending one, followed by a number (perhaps none) of un-evaluated ones. (The evaluated and pending ones may be re-read freely.)

4. The number 0 will be reserved for the null value in evaluations. Should a 0 in any dimension mean abstention from

that dimension only or from all of them? An abstention is considered an evaluation for the purposes of the forced evaluation rule.

5. A "q" in any dimension will cancel the pending evaluations. This is not considered an evaluation; the message is still pending.

6. Statistics to be kept for each message (for each dimension):

(dimension name); Number of evaluations; Average evaluation;
Number of abstentions; distribution of evaluations for each value in the dimension; (each users evaluations)

The first one is optional; the last one may be difficult to do (perhaps a future extension). Any others?

7. Headers will be shown to user only for evaluated messages. They may conatain some or all of the above statistics (which ones?)

==========
cosy.specs/requirements #9,cosymgr, 521 chars, 27-Nov-88
Comment to 7.

The interaction will be similar to yours except for the restrictions imposed by the forced evaluation rule. Error messages will be provided for all out-of-range attempts:

read: 25

Sorry, you are not permitted to read message #25; message #19 has not yet been evaluated...
read:

As for incentive, I'm not sure what you mean. All we can do is provide the facilities for evaluations. Incentive and motivation seems (to me) to be external to this (say, at the classroom level). Can you please clarify?

==========
cosy.specs/requirements #10,tutor, 2946 chars, 29-Nov-88
Comment to 8.
Comment(s).

Some comments on your latest:

1. Permitting the withdraw command is ok, but the evaluation data should be kept for the stats (there are two kinds of stats, one for the header, and one for research purposes;

more on that in #6). For research purposes, it's important that no data be discarded.

3. I know I've implicitly agreed to the forced evaluation rule as you put it in your last message, but I think I only understood it partly. There is still a big problem: it's not satisfactory for users to only be able to file one new message at a time. The whole idea of the evaluation features is to get students to think more deeply about their peers' contributions. This goal is not furthered much if they are prevented from downloading a series of new messages in order to study them. I still don't quite understand why you're insisting on two pointers. It appears that the functionality of the read and other commands will be altered as much by your approach as mine - the transformation of last to next is pretty major.

4. A 0 in the first dimension should be considered an abstention from all dimensions. The dimensions are related to each other, so part evaluations don't have much value.

6. Stats for each message (to be displayed in the header of evaluated messages):
# of evaluations, followed by means of ratings for each dimension
(example: 5 evaluations - Dim. 1: 3.4 - Dim 2: 2.2 - Dim 3: 4.0)

(no need for # of abstentions or distributions in the header)

Stats required for research (should be possible to monitor all quantities for a certain time period, eg. weekly):
- mean ratings on each dimension for each user's messages, and for all messages (total of ratings / total messages);
- mean evaluations completed by each user on other users' contributions;
- mean variance or standard deviation of all ratings on each dimension (variance to be calculated for each message). (this is to measure the spread between different users' evaluations, over time).

7. You've hit on something great, re. the headers! No headers will be shown at all on unevaluted messages (how about just numbers)? Good idea! This will take care of the pseudonymity issue rather neatly. Evaluations will not be biased by identity, but people will still be able to develop reputations, since their anonymity is only intermittent.

Finally, with regard to incentive, I talked about this in my Nov. 13 message. It goes back to my complaint about filing only one message at a time. I simply thought that we could create *incentive* for users to evaluate promptly by getting

"new" messages to pile up unless they are evaluated. This seems to be a reasonable "softer" way to force evaluations.

I think it may be time to spend a Saturday afternoon together (face-to-face) to iron all this stuff out...

==========
cosy.specs/requirements #11,tutor, 304 chars, 29-Nov-88 00:53
Comment to 10.

I meant (but forgot) to add something regarding the statistics. It is that I do not expect the research stuff to all be done automatically. Of course it would be nice, but I can also do it manually. What I will need, though, is ready access to ALL of the raw evaluation data on every message and user.

==========
cosy.specs/requirements #12,cosymgr, 981 chars, 29-Nov-88 15:07
Comment to 10.
----

1. The withdraw command removes the text; the evaluations will therefore be for an unknown message. If that doesn't bother you, then we'll keep the results.

2. I still need the two pointers regardless of the selected functionality: one may re-read messages, but one cannot re-evaluate them. What you're suggesting, I think, is that the FILE command should capture all new messages without affecting the read pointer. The user will still not be permitted to read past the pending one.

3. Actually, that header thing was a mistake. I meant that the statistics would not be shown on unevaluated messages. However, it may be very interesting to control the display of headers (for anonymity).

4. Regarding statistics, would you like to see some form of a report generator for accumulated statistics? For easy access by the moderator? or the system manager (security reasons)?

Yes, I think we should have a face-to-face meeting...

==========
cosy.specs/requirements #23,cosymgr, 881 chars, 6-Dec-88
Comment(s).

CoSy Modifications
CoSy COMMANDS CoSy v2.04

D. Kourkopoulos:

0 Legend:

First Column: Status (of command for mods):

y: keep
n: remove
c: change/restrict
?: uncertain

Second Column: Priority:

1..n: priority

1 ANY MODE (Commands Available At Any Prompt)

Created: 3 Dec 1988 Revised: 5 Dec 1988

1.	y	1	bye	6.	y	1	join
2.	y	1	converse	7.	y	1	mail
3.	y	1	edit	8.	y	1	moderate
4.	c	1	file	9.	y	1	option
5.	y	1	help	10.	y	1	show

1.2 Modifications

Command: 1.4 file
Modification: See READ MODE (3.4.13 file). Also, a new command, file new, will be available in Read mode (3.2.1.1 file new).

==========
cosy.specs/requirements #24,cosymgr, 3521 chars, 6-Dec-88
Comment(s).

CoSy Modifications
Moderator Commands CoSy v2.04

2 MOD MODE

Created: 1 Dec 1988 Revised: 5 Dec 1988

2.1 Commands Currently Available (descriptions in User's Manual):

2.1.1 To get to mod mode:

1.	y	1	mod

2.2.2 Available at the mod prompt:

1.	y	1	add	10.	y	1	new
2.	y	1	change	11.	n	_	open

```
3.  y  1  closed                12. y  1  quit
4.  y  1  confidential          13. y  1  remove
5.  y  1  delete                14. ?  _  ro
6.  y  1  describe conference   15. y  1  show
7.  y  1  describe topic        16. ?  _  rw
8.  y  1  help                  17. y  1  terminate
9.  y  1  moderator
```

2.2 New Commands (for EVAL mods):

General Points:

1. y 1 :it should not be permitted for a regular conference (already in progress) to be changed to an EVAL conf or vice versa.
2. y 1 :by default, EVAL confs are closed; they may be made confidential.
3. y 1 :when a conf is created the system prompts the user for all the necessary information (as is currently done for regular conferences).

2.2.1 To get to mod mode:

1. y 1 mod eval [confname]: create a new EVAL conference. See Sample Session (2.5).

2.2.1 Available at the mod prompt:

```
1. y  1  eval:      create a new EVAL conference.
2. y  1  describe dimension [confname] [topicname]
                      [dimension]:
                    change the description of a
                     dimension.
3. y  2  set range [confname] [topicname] [dimension]:
                    redefine the range of a dimension;
                     this also includes redefining dim.
                     value descriptions.
4. y  2  describe value [confname] [topicname]
                      [dimension]:
                    change the descriptions of a range of
                     dim. values.
5. y  2  change dimension [confname] [topicname]
                      [dimension]:
                    change a dimensions name.
6. y  1  report [confname] [topicname]:
                     generates a report of the raw data
                      accumulated in a topic of an EVAL
                      conference. See 2.3 for format.
7. y  2  eval header toggle [confname]:
                    controls display of eval headers.
8. y  2  header toggle [confname]:
                     controls display of regular headers
                      (for anonymity).
```

2.3 Display Formats

1. Report Generator

[confname]/[topicname]

Message: nnn Size: nnnnn words
Created by: [username] dd-mmm-yy hh:mm
Total Evaluations: nnn Abstentions: nnn
Distribution of values:

Range: 1 2 3 4 5 6 7 8 9 10
[dim. #1]: nn nn nn nn nn nn nn nn nn nn; mean: nn.n
[dim. #2]: nn nn nn nn nn nn nn nn nn nn; mean: nn.n
[dim. #3]: nn nn nn nn nn nn nn nn nn nn; mean: nn.n
[dim. #4]: nn nn nn nn nn nn nn nn nn nn; mean: nn.n
...

Message: nnn
etc...

2.4 Modified Commands:

Command: 2.2.11 Open
Modification: Not permitted for an EVAL conference.

Command: 2.2.14 RO; 2.2.16 RW
Modification: Not available in initial version. To be determined (TBD) after initial version delivered.

==========
cosy.specs/requirements #25,cosymgr, 4481 chars, 6-Dec-88
Comment(s).

CoSy MODIFICATIONS
Read Commands CoSy v2.04

3 READ MODE
PART 1

Created: 29 Nov 1988
Revised: 5 Dec 1988

3.1 Commands Currently Available (descriptions in User's Manual):

3.1.1 To get to read mode:

1. y 1 read
2. y 1 join
3. y 1 <RETURN>
4. y 1 [confname]/[topicname]

3.1.2 Read mode commands:

1.	n	_	all	17.	c	1	<RETURN>
2.	n	_	backward	18.	c	1	say
3.	c	1	comment	19.	y	2	search
4.	y	3	copy	20.	y	1	show all
5.	y	3	date	21.	y	1	show mail
6.	y	1	download	22.	y	1	show <confname>
7.	y	1	first	23.	c	1	show new
8.	n	_	forward	24.	y	1	show participant
9.	c	1	header	25.	y	1	show resume
10.	c	1	help	26.	y	1	show status
11.	c	1	last	27.	y	1	show who
12.	c	1	[msg#]	28.	y	1	show workfile
13.	c	1	[msg#]to[msg#]	29.	c	2	skip
14.	y	1	quit	30.	y	1	upload
15.	c	2	reference	31.	c	1	withdraw
16.	y	1	resign	32.	c	1	file

3.2 New Commands (for EVAL mods):

General Points:

1. n _ :define new prompt for EVAL confs? (eval: or eval-read:)
2. y 1 :forced evaluation: the user is not permitted to read past the next (pending) unevaluated message until it has been evaluated.
3. y 1 :user is not permitted to re-evaluate a message.
4. y 1 :user is not permitted to evaluate own messages.
5. y _ :any command that displays the text or header of the pending message will then provide the Eval/action prompt.

3.2.1 Available at the Read prompt:

1. y 1 file new :places into scratchpad all new messages in an EVAL conference. It does not set those messages as 'read'; they are still unread and unevaluated.See also 3.4.14.
2. y 3 myview :similar to header, except it only shows the headers (regular and eval) of the user's messages.

3.2.2 Available at the Eval/action prompt:

1. y 1 q*uit :do not evaluate message; message still unevaluated
2. y 1 r*eread :read the message again.
3. y 1 e*val :evaluate message; display each dimension and range
4. y 1 h*elp :display list of commands available at this prompt and their descriptions.

5. y 1 a*bstain: abstain from evaluation; message is considered evaluated (an undocumented feature).

3.2.3 Available at each dimension:

1. y 1 0 (zero) :abstain from evaluation (all dimensions).
2. y 1 1..n :an evaluation for the dimension; next dimension prompt is then displayed; n is set by moderator in MOD mode. Out-of-range responses will re-display same dimension prompt.
3. y 1 q*uit :quits the evaluation; message still unevaluated; no evaluations are kept.
4. y 1 h*elp :gives a description of the dimension (defined by moderator in MOD mode).

3.2.4 Available at the Add/action prompt:

1. y 1 a*dd :keep evaluations; they are added to message; then display eval header of message with current stats.
Header display may be toggled off by moderator in MOD mode.
2. y 1 q*uit :do not keep evaluations; return to read prompt.
3. y 1 e*dit :edit evaluations. Indicate user's evaluations and ask if s/he wants to change them.
4. y 1 h*elp :display list of commands available here and their descriptions.

NOTE: at any prompt a "?" may also be used to get help.

3.3 Display Formats

1. Eval Headers:

```
------------------------------------------------------------
Evaluations on message nnn as of dd-mmm-yy  hh:mm.
nnn evaluations  means: [dimension #1]: nn.n; [dimension #2]:
nn.n; [dimension #3]: nn.n [dimension #4]: nn.n;   etc...
------------------------------------------------------------
==========
cosy.specs/requirem nts #26,cosymgr, 4937 chars,  6-Dec-88
Comment(s).
----------
3 READ MODE    PART2
```

3.4 Modified Commands:

NOTE: for the descriptions below the following terminology is used: The messages in a topic, as seen by a user at any given time, consist of a number of EVALUATED messages, followed by the PENDING one, followed by a number (perhaps none) of UNEVALUATED ones. The pending one is the next

message not evaluated. If all the messages have been evaluated then there isn't a pending one.

1. Command: 3.1.2.3 Comment
   Modification: After the user has added a message, it will be considered evaluated (specifically: abstained) for the user. This covers the non-self-evaluation requirement. The user may not see the message until it becomes the pending one.
2. Command: 3.1.2.9 Header
   Modification: It is restricted by the forced evaluation rule: it will only show the headers of evaluated and pending messages. Thus, if the range in a "header [range]" command goes beyond the pending one, the command will execute on the restricted range, and an error message will displayed. In a "header [msg #]" command, the same restriction holds: unevaluated message headers will not be shown (only an error message).

3. Command: 3.1.2.10 Help
   Modification: Help will be modified to include the new commands and changes to the old ones.

4. Command: 3.1.2.11 Last
   Modification: Forced evaluation: if the last message is a pending or evaluated one, then it is displayed. If the last message has already been evaluated, then an eval header will also be displayed. If the last message is an unevaluated one, then an error message is displayed, followed by the display of the pending message. This is done to make it easy for user to find the pending message.

5. Command: 3.1.2.12 [msg #]
   Modification: Similar to Last (3.4.4), except when message [msg #] is an unevaluated one: it will not display the pending one (only the error message will be given). If message [msg #] is evaluated then an eval header is also shown.

6. Command: 3.1.2.13 [msg#] to [msg #]
   Modification: The range restriction in the Header (3.4.2) command applies here. The range will be cut-off at the pending message if it goes beyond it. If the range involves only unevaluated message then only an error message will be displayed. The eval headers of evaluated messages are also shown.

7. Command: 3.1.2.15 Reference
   Modification: A reference cannot go beyond the pending message. An error message will be given, and the reference feature stopped.

8. Command: 3.1.2.17 <RETURN>
   Modification: If the pending message has not been read, then it will be displayed, followed by the Eval/action prompt. If it has been read, then only the prompt will be given.

9. Command: 3.1.2.18 Say
   Modification: Same as Comment; see 3.4.1 above.

10. Command: 3.1.2.23 Show new
    Modification: For EVAL conferences, the symbol "e" will be appended to the number of unevaluated messages.

11. Command: 3.1.2.29 Skip [to]
    Modification: It cannot skip beyond the pending message. An error message will be displayed if the user attempts to do so, and the command will fail.

12. Command: 3.1.2.31 Withdraw
    Modification: The message text will be removed, but any evaluations that have been done will be retained.

13. Command: 3.1.2.32 File
    Modification: Similar to the Header command (3.4.2). If a range is used, then it will be restricted. If a [msg #] is used, and it is an unevaluated one, the command will fail and an error message displayed. For evaluated messages, the eval header will also be copied into the scratchpad. The user may use file new (3.2.1.1).

NOTE: In all the above error messages in which an attempt is made to go beyond the pending one, then the pending message number will be given. (e.g. You have not yet evaluated message #nnn)

14. Command: 3.1.2.1 All
    Modification: All displays all new messages in all the user's conferences. This would violate the forced evaluation rule, thus it will not be implemented.

15. Command: 3.1.2.2 Backward, and 3.1.2.8 Forward
    Modification: Backward is not permitted because of conflict with forced evaluation rule. Forward is the default, thus it has no effect.

==========
cosy.specs/requirements #27,cosymgr, 2139 chars, 7-Dec-88 16:00
Comment(s).

CoSy Modifications
Sample Session: Restricted command usage and error messages:

```
: "sh new:
   Conf/topic                                    New Messages
 evalconf/topic1                                     2;3e

: "<RETURN>"
Joining conference evalconf, topic topic1, 2 unread and
3 unevaluated messages of 22.
THIS TOPIC IS READ AND EVALUATE

Read: "<RETURN>"

Eval/action: "q"

Read: "last"                          {effect of last command}
Message 20 was not evaluated.
You are not yet permitted to see message #23.

==============
evalconf/topic1 #20,  etc...
--------------
TITLE:  blah                {pending message is displayed}
.
Eval/action: "q"

Read: "22"                       {effect of [msg #] command}
Message 20 was not evaluated.
You are not yet permitted to see message #22.
                          {pending message not displayed}
Read: "header 19 to 21"          (effect of header command}

==============          {since 19 is evaluated, its eval
evalconf/topic1 #19,  etc...         header is also shown}
-------------------------------------------------------
Evaluations on message 19 as of 6-Dec-88  13:35
15 eval'ns: CLARITY: 2.5; RELEVANCE: 4.0;  ORG'N: 5.1
-------------------------------------------------------
TITLE:  blah

==============
evalconf/topic1 #20,  etc...
--------------
TITLE:  blah

Message 20 was not evaluated.
You are not yet permitted to see message #21.

Read: "<RETURN>"                       {effect of <RETURN>}
   {user is warned that there are messages in this conf}
There are unevaluated messages in this conference.
       {then it checks for new messages in other confs}
Checking for conference activity...
No more new messages.

: "bye"
```

==========
cosy.specs/requirements #33,cosymgr, 1911 chars, 11-Dec-88
Comment(s).

CoSy MODIFICATIONS Revisions
11/12/89

****
Revised priorities:

2.2 New Commands (for EVAL mods):

2.2.1 Available at the mod prompt:

1. y 2 eval
2. y 2 describe dimension
3. y 3 set range
4. y 3 describe value
5. y 3 change dimension
6. y 2 report
7. y 3 eval header toggle
8. y 3 header toggle

****
Revised status:

3.1.2 Read mode commands:

21. c 1 show all

****
Revised command descriptions:

(NOTE: File was placed in proper alphabetical order in the list of commands in 3.1.2; thus, it is command 3.1.2.7. The other command numberings are adjusted accordingly.)

3.4 Modified Commands:

In the Command lines:
Brackets, ( ), indicate optional command formats.
Angle brackets, < >, represent keyboard keys.
Square brackets, [ ], represent parameters.

*****
2. Command: 3.1.2.10 Header [msg #] (to [msg #])

*****
11. Command: 3.1.2.30 Skip (to) [msg #]

*****
12. Command: 3.1.2.32 Withdraw [msg #]

*****
13. Command: 3.1.2.7 File [command]
Modification: Effect depends on command used. If a range [msg #]-to-[msg #] is used then it will be restricted. If a [msg #] is used, and it is an unevaluated one, the command will fail and an error message displayed. For evaluated messages, the eval header will also be copied into the scratchpad. The user may also use 'file new' (3.2.1.1). For any other command, see descriptions in this section (3.4), if modified, or in the User's Manual, otherwise.

*****
16. Command: 3.1.2.21 Show all
Modification: The symbol "e" will be used to identify closed EVAL conferences. The symbol "s" will be used to identify confidential Eval Conferences.

****

==========
cosy.specs/requirements #37,tutor, 3358 chars, 11-Dec-88
Comment to 24.
Comment(s).
----

2 I'm not sure how you plan to structure the final document you will produce, but a clear distinction should be made between moderating *new* and *existing* eval/conferences. Your message 17 has a sample session for a new conf, but there is no sample for an existing one.

2.1.1 Mod by itself does not lead to the mod: prompt. You should perhaps clarify this. Also, the *modified* existing commands in 2.2.2 will only be accessed by getting into the "mod eval" mode (ie. mod [evalconfname]).

(your numbering's off on 2.2.2 - should be 2.1.2)

2.1.2.10 "new" is not available as a command when moderating existing conferences.

2.1.2.11,14,16
In light of the differences between moderating new vs. existing conferences, we should reconsider the open, ro and rw commands. It is clearly appropriate to force an eval/conference to be closed when it is *created*, but it should be possible to open it up for viewing when the conference-related tasks are finished. However, it would not make sense to force evaluation (or even abstention, which is undocumented) upon these "post-viewers", so a newly opened eval/conference should also be made read-only. (This can of course be up to the moderator to figure out, or the open and ro commands could be linked as one.) In summary, I suggest that for the first version you leave the open, ro and

rw commands as they are, and stick with the simple idea of making eval/conferences closed when they are created.

2.2.1 You should probably stick with EITHER mod new OR mod eval for creating an eval/conference. Why not just stick with mod new (or mod new [evalconfname]) and always have "Evaluation conference?" as the first question asked by the system.

(numbering - 2.2.1 should be 2.2.2)

2.2.2 These are new commands available for moderating an existing eval/conference. The commands available for a new conf are in message 17.

2.2.7,8
Should be more specific about what the header toggles do (ie. the effect that evaluating a message has on header display if toggle is off or on, and so on).
I think we had agreed to the following:
- with eval header toggle ON (default condition), users see the eval header AFTER they have evaluated the message in question.
- with eval header toggle OFF, eval headers are NEVER displayed to users (useful for testing or other situations where evaluating or voting or responding should be private).
- with header toggle ON (default condition), message headers are always displayed, as usual.
- with header toggle OFF, users see message header only AFTER they have evaluated the message. Before message is evaluated (ie. when reading the pending message or filing new messages), users only see [confname]/[topicname] #nn at top of message.

2.3 Size: why words and not chars?

Small detail: numbers (nn), including 0's, should only appear in the report table WITHIN the acceptable range for each dimension (eg. if dim #2 has range of 1 to 5, then only BLANKS should appear from 6 to 10, not zero's). Add standard deviation (sd): n.nn, to the right of mean: nn.n

==========
cosy.specs/requirements #39,tutor, 664 chars, 11-Dec-88 20:44
Comment to 26.

3.4.2 The header of the pending message is not shown if the header toggle is OFF.

3.4.4 Good idea! (to give error message AND display the pending msg. -- much clearer to the user). Eval header displayed only if eval header toggle is ON.

3.4.5 Eval header displayed only if eval header toggle is ON.
3.4.6 ditto.

3.4.8 If pending message has been read, then you should first display its header (or condensed header if toggle is OFF) and THEN the eval/action prompt?

3.4.11 The effect on the skip command is that a user's first skip has to be backwards.

3.4.12 ...and the eval header remains intact as well.

==========
cosy.specs/requirements #45,cosymgr, 2267 chars, 16-Dec-88
Comment to 37.

I've decided not to make another software specification document. Since CoSy is an interactive program, its functions are determined by its set of commands. The modifications are also interactive. Thus, I could safely specify the behaviour of the modifications by specifying the behaviours of the commands. The rest of CoSy is unchanged. Also, I am dealing with the modification, not the creation, of a product. Many of the factors that are covered in a software requirements specification have already been considered in CoSy itself. It serves as a specification, just as the UNIX version served as a specification for the VMS version. (Besides, I don't have the time to spare to make a complete SRS.)

Your points:

2. The distinction is implicit. When creating a new conference, the moderator is taken through the procedure (as in message 17). When moderating an existing one, the mod: prompt is given.

2.1.1 You're right, mod by itself does not lead to the mod: prompt. Thus:

2.1.1.1 y 1 mod (new) [confname]

In order to distinguish between the sets of commands available to the moderator for regular and eval conferences, when moderating an eval conference the prompt should be mod-eval:. Thus:

2.1.2 Available at the mod-eval prompt:
2.2.2 Available at the mod-eval prompt:

2.1.2.10 I checked it out and new is available as a command at the mod prompt, even when moderating an existing conference.

2.1.2.11,14,16 The decision on open was clear (i.e. based on controlled evaluations). The use of ro and rw is undecided

(hence, the ? as status). Ro, in particular, may be useful, but it will have a low priority (say, 3).

2.2.1 O.K. we'll get rid of "mod eval [confname]" and leave it as "mod new [confname]", for creating a new eval conference. This makes it easier for me, because I won't have to modify the commands available at every other prompt to accept "mod eval".

2.2.7,8 The descriptions you give are good; they will be included.

2.3 I noticed that I has written "words" instead of "chars" after it was added to the conference. Chars, it is. Blanks will appear in non-range numbers. Standard deviation will also be included.

==========
cosy.specs/requirements #59,cosymgr, 1400 chars, 31-Jan-89 --
----
Modifications to Specification

2 MOD MODE

2.1.2 Available at mod prompt:

1.	y	1	add participant
1.1	c	1	add topic
2.	c	1	change [oldtopic] [newtopic]
10.	c	1	new
11.	y	3	open
17.	n	-	terminate (does not exist)

(The following commands were not included in the specification, but are available in MOD mode)

18	y	1	bye
19.	y	1	edit
20.	y	1	file
21.	y	1	option

2.4 Modified Commands

4. Command: 2.1.2.1.1 Add Topic
Modification: Topics in an EVAL conference are (structurally) different from topics in a regular conference. Thus, in addition to creating a new (regular) topic, this command must also prompt the user to define the evaluation dimensions, value ranges, and value descriptions.

5. Command: 2.1.2.2 Change [oldtopic] [newtopic]
Modification: Again, since EVAL topics are different from regular topics, the changes must take into account the dimensions, ranges, and value descriptions.

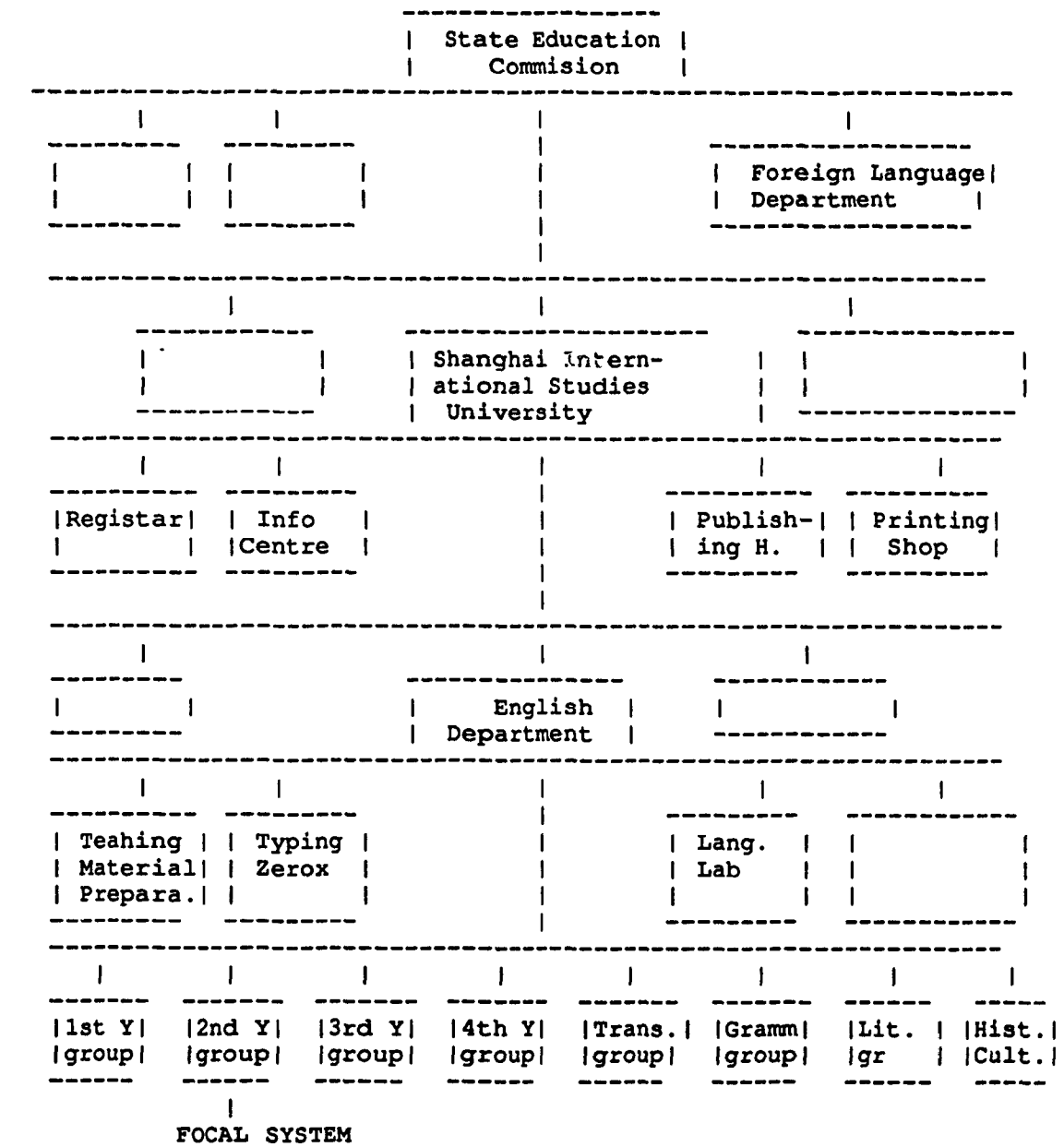
6. Command: 2.1.2.10 New
Modification: Creating a new EVAL topic requires, in addition to the information generated for regular conferences, the definition of the dimensions, ranges, and value descriptions for each topic created.

Appendix E

Excerpts from the ETEC 606 Computer Conferences

==========
alphabits/sysesl #92, indigo, 2736 chars, 24-Oct-89 11:52
Comment(s).

TITLE: phase III



==========
alphabits/sysesl #93, indigo, 287 chars, 24-Oct-89 12:23

TITLE: 3.1. Supera-systems
At the top is the State Education Commision. At the next level is the university. The immediate supera-system is the department.
Note that in the diagram all the filled boxes are the environment of the F. S.. Empty boxes are not directly relevant to the F.S..

==========
alphabits/sysesl #94, indigo, 610 chars, 24-Oct-89 12:29

TITLE: Boundaries
3.2.1. The F.S. could not have any influence on the State Commision regarding its policy on foreign lang. education and funding etc. except as an insignificant part of the supera-system's feedback loop.
3.2.1. At the uni. level, the F.S. could have some influenceon the allocation of money for reseach, on the selection of students.
At the department level, the FS has much control over the selection of teaching materials and methods, though they have to have the approval of the department. It could also influence students inputs by feedforward loop to the first year teaching group.

==========
alphabits/sysesl #95, indigo, 757 chars, 24-Oct-89 12:40

TITLE: 3.3. Inputs
State Education Commion -- funding (through the uni.), plocies and guidelines regarding the training of foreign language personnel through its foreign language department.
The university-- students inputs, money for reseach, logistical supoort (e.g. printing of teaching materials), technical support (computer service, lang. lab facilities) and information on teaching methdology research. It also makes decision on the direction of the training (Should we train the students to be translators for government agencies or to be foreign trade personnel?).
The department-- curriculum, new teachers, some teahing materials, money for some extra-currilum activities, typing and lang.lab facilities, and teacher training opportunities.

==========
alphabits/sysesl #96, indigo, 377 chars, 24-Oct-89 13:01

TITLE: 3.4.
Outputs: -- students who have reached the level of English proficiency et in the currilum.
-- good teaching materials, textbooks produced by the group and often published and used by other institutions.
-- research papers on language acquisition, general linguistics and English literature
--teacher trainees going out to teach in other institutions and schools

==========
alphabits/sysesl #97, bronze, 87 chars, 24-Oct-89 15:03
Comment to 92.

GREAT GRAPHICS!!!!!! . . . . and it helps with understanding the systems a great deal.

==========
alphabits/sysesl #98, indigo, 2943 chars, 24-Oct-89 14:54
Comment(s).

TITLE: Phase III
Diagram of supera-systems

(...)

==========
alphabits/sysesl #99, indigo, 248 chars, 24-Oct-89 15:32

TITLE: 3.1. Supera-systems
-- The State Education Commision at the top
-- The University
--The English Dpartment
Note that in the diagram, the empty boxes are not directly relevant to the FS. The filled boxes constitutes the environment of the FS.

==========
alphabits/sysesl #100, indigo, 644 chars, 24-Oct-89 15:36
Comment(s).

TITLE: 3.2.Boundaries
The FS could not have any influence on the State Commision regarding policies and guidelines on foreign language personnel training, except as an insignificant part of the supera-system's feedback loop.
-- At the university level, the FS has some influence on students inputs, allocation of money for research, purchasing of audio-video equipments and language research and teaching books.
At the department level, the FS has an ifluence on curriculum design, the selection of teaching materials and methodologies, teacher training programs and students inputs by the feedforward loop to the first year teaching group.

==========
alphabits/sysesl #101, gray, 306 chars, 24-Oct-89 16:47
Comment to 92.
----
your diagram really helped me to "see" where your system fits into the whole scheme of things. thanks. my only comment is i hope you try to stay in the area of your second group as far as talking about things, because i would be insane if i had to describe all of the things that you put on your diagram.

==========
alphabits/sysesl #102, gray, 537 chars, 24-Oct-89 16:54
Comment to 100.
Comment(s).
More refs to 100.
----
your work is really great! my only problem (and this applies to the other systems as well) is that i find it really hard to comment on these systems because of the limitations of the screen. i.e. there is only so much one can put on one screen. so when someone is describing their system i find that it is really hard to make comments . particularly, in view of the fact that i can't visualize things very well. it sounds like

i'm trying to make excuses but i thought i would voice this opinion. i hope others are feeling the same way.

==========
alphabits/sysesl #103, bronze, 293 chars, 24-Oct-89 17:48
Comment to 100.
Comment(s).

It is very unfortunate that the focal system can have no direct influence on the State Commission regarding policies and guidelines. However, this is an evaluative statement. To think that one's ideas about what one is teaching are insignificant to the State Commission is distressing to me.

==========
alphabits/sysesl #104, bronze, 202 chars, 24-Oct-89 17:51
Comment to 102.
Comment(s).
More refs to 102.

The diagrams certainly help, and I think that as we go along things will gradually become much clearer. This is my hope. In fact, other peoples' systems are much clearer to me now than they once were.

==========
alphabits/sysesl #105,tutor, 262 chars, 24-Oct-89 22:51
Comment to 102.
More refs to 102.

You're right, Tim, but a useful option is to print a hard copy of the stuff you want to have a better look at. I realize that printing may be a pain if you don't have your own eqpt at home, but it's worth the trouble, especially for a rich system like Mike's!

==========
alphabits/sysesl #106,tutor, 306 chars, 24-Oct-89 22:52
Comment to 103.
More refs to 103.

What you are describing is for a later phase, Mark, but it's a good point to make anyhow. Your example says clearly that the ABSENCE of feedback loops is also significant in system modeling. Sometimes they should be there contributing to the stability or growth (etc etc) of the system, but they're not.

==========
alphabits/sysesl #107, purple, 595 chars, 25-Oct-89 09:33
Comment to 89.
Comment(s).

Nonetheless, quitters of any system may suggest something about the system which is not immediately apparent. In the case of SYSESL, students who quit tells the State that other students who would have liked to attend and complete the course couldn't because the quitters took their place for this year (or other). This involves costs to the State, which should perhaps be considered as undesirable. So, whether there is one quitter or more still can be an undesirable output to the

system, and moreso as the number increases. Voila! This is my interpretation. Does anyone share my thought?

==========
alphabits/sysesl #108, purple, 58 chars, 25-Oct-89 09:45
Comment to 91.

I am glad to be of help in the development of you model.

==========
alphabits/sysesl #109, purple, 98 chars, 25-Oct-89 09:52
Comment to 98.

Is this the same graphic as before, I don't see the differences. Please correct me if I am wrong.

==========
alphabits/sysesl #110, purple, 368 chars, 25-Oct-89 09:56
Comment to 102.
Comment(s).

Tim, I think that at this stage we are required to print the messages and read them slowly before relecting on the ideas. It is no longer a read and comment process, but rather a read, think, digest, and comment process. At least that is the way I see it. For this reason, it takes longer for the replies or comments to enter one's system to help the model's growth.

==========
alphabits/sysesl #111, purple, 31 chars, 25-Oct-89 10:03
Comment to 104.

I agree, diagrams really help.

==========
alphabits/sysesl #112, bronze, 371 chars, 25-Oct-89 10:52
Comment to 107.
Comment(s).

Aha! Now we're dealing with expectations. The system expects everyone to pass. One way to do this is to raise the entering competencies to such a height that there would be little chance that anyone would fail. Another way, of course, is to lower the standards for those who are taking the course. The latter way would cause serious problems.
Just a few thoughts. . . .

==========
alphabits/sysesl #113, gray, 377 chars, 25-Oct-89 18:13
Comment to 112.
Comment(s).
----
your remark made me want to mention something. i think that it is important to remember when one is talking about quitters , whether or not these quitters are people who have quit voluntarily or who have been asked to leave. i believe that the way one looks at the term will determine how one classifies the term i.e. aswhether or not it is an undesirable or desirable output.

==========
betabits/decision #86, yellow, 1377 chars, 9-Nov-89 19:37
Comment(s).

TITLE: Control

Here is a provisional list of control measures that the system potentially has:

1.patient selection by teacher: I try to select patients that are appropriate to the level of the student. The patient's condition however can worsen between the time of selection and the next day when the student cares for the patient. This is a possible "life threatening" or "quality" threat to the f.s. Short of completely changing the assignment, there is a lack of requisite variety to solve this disturbance.

2.Feedback to student: A clinical taecher has only 6 to 8 students This should minimize the time delay in responding. Another related control measure is teaching the student how to use the clinical teacher effectively so that he/she is not wasting time.

3.Control measures to deal with poor decision making modelling by staff.Here is another area that may lack requisite variety. The teacher can try to be the good role model, the teacher can try to get to know staff well enough to pick out the good role models for the students to deal with,and if worse came to worse ,a new ward could be sought.

I'm not very satisfied with this list. There may be more areas where a lack of requisite variety exists. I would especially like to think more about control measures for time delay in responding to students while they are going thru the process of learning d.m.

==========
betabits/decision #87, yellow, 167 chars, 9-Nov-89 20:05
Comment to 86.

Control measures continued:
2 other control measures to briefly mention: written assignments and formative weekly evaluations using specific behavioural criteria.

==========
betabits/decision #88,mauve, 92 chars, 11-Nov-89 13:40
Comment to 85.
More refs to 85.

At this point, I am now confused. I thought that noise was one type of disturbance variety.

==========
betabits/decision #89,mauve, 349 chars, 11-Nov-89 13:44
Comment to 49.

Mary. I was under the impression that inputs are from either within the focal system itself--from one subsystem to another/others, or from the

environment to the focal system in general or a subsystem in particular. I guess tha you've really already answered the question indirectly through your most recent work. I hope that I've also caught on.

==========
betabits/decision #90, yellow, 258 chars, 12-Nov-89 15:13
Comment(s).

TITLE: Eureka

Finally I have been able to identify the role the patient plays in the f.s.! The patient is the source of opportunity for the student to learn decision making. This clarification will help (I hope) when I go back to revise the sociostructure.

==========
betabits/decision #91, brown, 723 chars, 13-Nov-89 19:53
Comment to 63.
Comment(s).

Wouldn't the relationship between the patient and the student be ths most imortant loop in your focal system and whether this loop is deviation-amplfying or deviation-limiting depend on the personalities of the student and patient involved. If a patient just couldn't be bothered being looked after by anyone, especially a student nurse, the student would have a hard time getting any kind of meaningful information from the patient to help and make decisions. Another kind of patient may just be communicative and positive enough himself to help the student have a worthwhile learning experience. So, the patient helps t he student learn directly but does not contribute to other things directly like nursing concepts.

==========
betabits/decision #92, brown, 331 chars, 13-Nov-89 19:59
Comment to 64.
Comment(s).

No, I don't agree that you can have a relationship existing between people and ideas on paper when you are referring to a hierarchy. Wouldn't the course concepts be communicated to the student through the teacher and, therefore, there is no need to show the student's relationship to documents and course concepts as a hierarchy.

==========
betabits/decision #93, brown, 335 chars, 13-Nov-89 20:03
Comment to 67.

Yes, Mary, I agree with you. There seems to be a lot of redundancy in this model-making with ideas one seems to have covered in an earlier section being asked for again in a different way in another section. Maybe this is a way for us to get these ideas drummed into our heads and to work with them a little bit differently each time.

==========
betabits/decision #94, brown, 31 chars, 13-Nov-89 20:06
Comment to 68.

What do you mean by remediate?

==========
betabits/decision #95, brown, 330 chars, 13-Nov-89 20:11
Comment to 85.
Comment(s).

Could noise just be background distrubance which does not really have an adverse affect on the system;like being in a room for a course that is to hot or too stuffy. Where, distrubance variety is a disturbance that can really affect the system and poses a real challenge to the system to be used either negatively or positively.

==========
betabits/decision #96,tutor, 66 chars, 13-Nov-89 20:53
Comment to 90.
Comment(s).
More refs to 90.

Good plugging away, Mary! So I guess that makes the patient kind of a decision makee?

==========
betabits/decision #97,tutor, 100 chars, 13-Nov-89 20:54
Comment to 91.
More refs to 91.

Sounds like you and Mary were on parallel paths, Katherine. The patient's role is much clearer now.

==========
betabits/decision #98,tutor, 615 chars, 13-Nov-89 20:59
Comment to 95.
Comment(s).
More refs to 95.

I think disturbance variety has to be looked at in relation to control variety. The former represents the number and nature of possible states of the elements of the system, which will need to be controlled or regulated. The term "disturbance" is not really negative, just a fact of life, e.g. the trajectories of three balls being juggled are the disturbance variety which has to be countered by the control variety of the juggler's hand movements.
Noise, on the other hand, is more of a negative thing to be avoided or gotten rid of (e.g. as in signal to noise ratio). Anybody see any POSITIVE sides to noise?

==========
betabits/decision #99, yellow, 534 chars, 14-Nov-89 18:56
Comment to 91.

Well katherine I've puzzled about what is the most important relationship and I've made a Canadian decision- namelt that student - patient rel'nship is vital because it provides the student with the opportunity to learn (therefore the patient's role is somewhat more passive than I originally envisioned: he is in a sense acted upon) .Equally vital is the student - teacher relationship, since the both are very active in the process of the student learning. Without these 2 rel'ships, the focal system's life would be in jeopardy.

==========
gammarays/cree #20, red, 1353 chars, 24-Oct-89 12:45
Comment(s).

TITLE: ENVIRONMENT AND CONTEXT

3.1 Suprasystems
Nursing programme
John Abbott College
Ministry of Education (Quebec)
Community health care system (local, Montreal and extending to James Bay)

3.2 Boundaries of f/s

Temporal	(not moveable):	Amount of class, lab, hospital experience
		Length of course (15 weeks)
		Weekly schedules of students and teachers
	(moveable):	Time for small group meetings
		Time for preparation, studying
Spatial:	(not moveable):	Size of class
		Facilities at college
		Distance to community (James Bay)
	(moveable)	Hospital facilities (for clinical experience)

Personal : Boundaries existed around people in the f/s (eg. cultural differences)

3.3 Resource Inputs
People - 2 nursing teachers, resource people within the college, coordinator of native education, Cree students, other nursing students
Time - Time put in by actors in the system
Money - From government- teachers salaries, all student expenses
Materials - For learning activities

3.4 Outputs
Students successfully completing first semester nursing course and then going on into next semester.

==========
gammarays/cree #21, red, 1126 chars, 24-Oct-89 13:03
Comment(s).

TITLE: ENVIRONMENT AND CONTEXT (continued)

3.5 Undesired inputs from environment
Problems with living accomodations, financial difficulties for students, demands of students families, demands of other courses taken concurrently

3.6 Undesirable outputs of f/s
Expense (time and money) of students travelling to James Bay
Lack of success in achieving objectives of course

3.7 Feedback loops
Successful students go on into next semester thereby becoming inputs to the nursing program and eventually into the health care

system. Successful students may encourage other native students to enter the program.

There are many feedback loops associated with this focal system (eg. teachers and studemts, students and counsellors, students and community. These feedback loops could be deviation amplifying (growth) or limiting (equilibrium) depending on the situation. The first 2 loops described would be amplifying.

3.8 Main sourses of control

Objectives of the nursing program (based on guidelines and regulations from Minister of Education and professional association (Order of Nurses of Quebec)

==========
gammarays/cree #22,boydg, 481 chars, 24-Oct-89 19:14
Comment to 17.
Comment(s).
---
that is very interesting. It seems to me that the biggest problem we have is what I call cultural symbiosis. How can fundamentally different world-view peoples live next door and nourish each other without either homogenizing their own identities, and losing their roots,
or without a master-slave situation dveloping? This is complicated by techno-progress & world population explosion, which means no way of life can go on as it used to.
We have to make the answers!!
en-avant!

==========
gammarays/cree #23,boydg, 309 chars, 24-Oct-89 19:23
Comment to 21.
Comment(s).
More refs to 21.
---
regarding 3.6 a travel expense is not an output
regarding 3.7 The important thing here is which of these loops mean life-or-death to the programme, and what are their charactweristic time periods? THink of actual cases where resources were cut-off or augmented; what happened from the loop point of view?
gb.

==========
gammarays/cree #24, red, 705 chars, 29-Oct-89 21:35
Comment to 23.
Comment(s).

I'm beginning to understand loops, I think. When the students" government cheques arrived late, they all had to miss 2 hours of nursing lab to get to the bank to pay the rent which was overdue. At the end of some months, they had no money for food. Deviation limiting- no money leading to less energy and time put into study, potential threat to viability of f/s.

On the other hand, when the students faced some racial discrimination from a teacher in another course, they got support and encouragement from the counsellor in student services. The students resolved the problem with their self esteem well intact . Deviation amplifying- satisfied students stay in the program and study more effectively.

==========
gammarays/cree #25, red, 904 chars, 29-Oct-89 21:47
Comment to 22.

This is one of our main concerns in the f/s. In a native nursing program in Sask. the teachers have regular meetings with the elders of the Cree community who actively participate in program development (help with writing case studies that reflect Cree culture, describing traditional methods of health care and important "rites of passage" in their growth and development).
For example, we are concerned about cultural bias in our exam questions (amazing that we didn't notice this bias until we became involved in this f/s). It will eventually be an important output of the f/s- that is, the inclusion of the beliefs, values etc. of people other than our usual student and especially teacher population. The teachers tend to be a very homogeneous group.
So that, in the end, we may be looking at including some other actors in the f/s, but this is too early in the project to make such a suggestion!

==========
gammarays/cree #26,tutor, 62 chars, 30-Oct-89 20:08
Comment to 24.
More refs to 24.

I agree, Suzanne. I think you do understand loops quite well!

==========
gammarays/cree #27, orange, 96 chars, 30-Oct-89 20:55
Comment to 20.
---
what about other outputs such as successful completion of courses evaluations and test results?

==========
gammarays/cree #28, orange, 74 chars, 30-Oct-89 20:57
Comment to 21.
---
good work suz, easy to read and consice, not like my long winded sayings!

==========
gammarays/cree #29, red, 256 chars, 31-Oct-89 09:34
Comment to 18.

Yes, there are certainly costs for the students as you mentioned. Time away from families and community , health concerns (for example, the change in diet was a problem for many of them, the noise and pollution leading to stress and respiratory problems).

(N.B.In order to hide the identity of participants, student ID's in the message headers have been replaced by pseudonyms.)