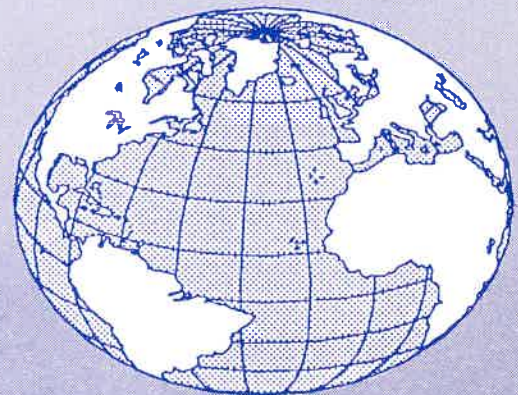


JOURNAL OF COMPUTER INFORMATION SYSTEMS

official journal of

INTERNATIONAL ASSOCIATION FOR COMPUTER INFORMATION SYSTEMS



VOLUME XXXIII
NUMBER 3
SPRING 1993

JOURNAL OF COMPUTER INFORMATION SYSTEMS

Volume XXXIII, Number 3
CONTENTS

Spring 1993

President's Column		1
Articles:		
	USER INFORMATION SATISFACTION FOR MAINTAINED ACCOUNTING SYSTEMS: THE VALIDITY AND RELIABILITY OF THE SHORT-FORM MEASURE STEVE D. WHITE & TIMOTHY PAUL CRONAN	2
	A STRATEGY FOR ACTIVE LEARNING VIA A CAI SYSTEM HOSSEIN SAIEDIAN	11
	PROTOTYPING EFFECTS ON THE SYSTEM DEVELOPMENT LIFE CYCLE: AN EMPIRICAL STUDY BILL C. HARDGRAVE, E. REED DOKE, & NEIL E. SWANSON	14
	MICROCOMPUTER USE OF INSTRUCTIONAL SOFTWARE IN SCHOOLS OF BUSINESS STEVE TEGLOVIC, JR. & ROBERT M. LYNCH	20
	STATUS OF PLANNING AND CONTROL SYSTEMS IN THE END-USER COMPUTING ENVIRONMENT ROBERT B. MITCHELL & RODNEY NEAL	25
	THE TRIUNE EXPERT: EXPERT SYSTEM DEVELOPMENT BY END USERS IN THE CHANGING ENVIRONMENT KURIAKOSE ATHAPPILLY, SIVAKUMAR NATARAJAN, & JOGIYANTO HARTONO	31
	INFORMATION SYSTEMS NEEDS OF LARGE CORPORATIONS HOOSHANG M. BEHESHTI & MELVIN R. MATTSON	35
	A STRUCTURED PROTOTYPING APPROACH CHARLES NECCO & NANCY TSAI	38
	THE USE OF FUNCTION POINT ANALYSIS TO ASSESS END USER COMPUTING SYSTEMS MICHAEL HIGNITE, RAYMOND JOHNSON & KENNETH FOSTER	46
	A COMPARISON OF INFORMATION SYSTEMS TOPIC EXPECTATIONS OF EXECUTIVE M.B.A. GRADUATES AND THEIR FIRMS' TOP COMPUTER EXECUTIVES RICHARD G. BORN	51
	SUCCESS FACTOR ANALYSIS AS AN INSTRUMENT FOR INFORMATION MANAGEMENT FRANZ LEHNER	58
	COMPUTER VIRUSES: SYMPTOMS, REMEDIES, AND PREVENTATIVE MEASURES CLIVE C. SANFORD	67
	EDUMASTER: AUTOMATED KNOWLEDGE ENGINEERING AND ACQUISITION H. HARRY ZHOU	73
	VARIABLES AFFECTING THE PLANNING AND IMPLEMENTATION OF OFFICE INFORMATION SYSTEMS CURRICULA WITHIN COLLEGE/UNIVERSITY SETTINGS C. STEVEN HUNT & HEIDI PERREAULT	77
	THE ETHICAL ISSUES OF AUTOMATED INFORMATION PROCESSING DAVID MALONE	82
Research Section:	A DEMOGRAPHIC ANALYSIS OF INFORMATION SYSTEMS FACULTY SUSAN W. ATHEY, JON D. CLARK, & W. JOHN PLOTNICKI	85
Technology/Book Review Section		91

A STRATEGY FOR ACTIVE LEARNING VIA A CAI SYSTEM

HOSSEIN SAIEDIAN
University of Nebraska
Omaha, Nebraska 68128

INTRODUCTION

Computers have been used in academic environments for (a) faculty research in computer science (and closely related fields), (b) teaching computer (science) courses such as programming, (c) administrative tasks such as registration, (d) document preparation and similar secretarial activities, (e) electronic mail and asynchronous communication, and (f) a teaching aid in many different subject areas. This paper is another contribution to the latter application, i.e., to use computers as an integral tool for teaching purposes.

Computers have been widely discussed as having the potential to radically change the students' learning process. One of our areas of research has been to examine yet another aspect of computers as a tool to achieve this goal, and, in essence, make computers an active integral part of the instruction process.

Students learn more by participating than by observing and listening. A Computer-Assisted Instruction tool that encourages more participation builds an interesting and creative environment. The focus of our research thus has been to provide an environment for active participation of students in course topics. We have developed such an environment and computers provide the resources for the foundation of this environment.

Our approach in using the computers is from a different perspective. We considered developing a simple yet very effective *computer-based conferencing system* to serve as a student/computer interface to accommodate student's learning process. We believe that our approach has successfully addressed one of the current observable deficiencies in education, i.e., a lack of enthusiasm from some students to more actively participate in course topics. This known deficiency has been alleviated to an extent by our *computer-based conferencing system*. The phrase *computer-based conferencing system* is used in this context to describe a computerized system for group work. Such a system supports asynchronous interaction among users and between users and a common *bulletin board*. This definition is used by other researchers. See for example Hiltz & Turoff (1981). A similar system that supports simultaneous (or real-time) interaction is described by Sarin & Grief (1985).

Our system is practical and requires a rather simple combination of software and hardware and has resulted in substantial enhancement of the presentation as well as the content of the course for which it was used. Its primary purposes have been to:

1. Encourage students to be more actively involved in topics related to the course they are taking,
2. Provide a self-assessment environment for students,

3. Provide an environment in which students are encouraged to cooperate with each other,
4. Provide a better means of communication between students and between a student and an instructor, and
5. Facilitate a forum for team-oriented, project-intensive courses so that students who are in a project team can better manage their activities.

A complete description of how our conferencing system has achieved all the above goals is outside the scope of this paper. We elaborate on the first item above, i.e. the potential role of the system in encouraging the students to actively involve themselves in the class topics and hence increase their learning.

COMPUTER-BASED CONFERENCING AS A CAI SYSTEM

The conferencing system is called **Talk**. It provides an effective environment for the students to contribute to a discussion topic related to the course. The system has a rather simple interface. We realized that for the students to actively use the **Talk** system, the interface had to be simple. Software based on the concept of "stepwise learnability" (Licklider 1977) decomposes the amount of information the user must assimilate into a set of unthreatening steps. We kept that in mind through the interface design process. The interface consists of a series of menu-driven screens with simple instructions.

In addition to the conferencing facility, the **Talk** system provides an electronic mail (E-Mail) facility. This facility is similar to traditional E-mail systems and allows students to send private mail messages to each other and to the instructor. The effectiveness of this facility as a teaching instrument is the same as those discussed by Welsch (1982).

The **Talk** system has a *bulletin board* which serves as a common area for the participants of the conference. Students and the instructor "post" (i.e., attach) their "articles" (a generic term for messages, replies, questions, solutions, ideas, etc.) to the bulletin board. These articles remain on the bulletin board until their time expires. Students are able to post an article, read an article, reply to one, etc. Students are initially asked to log on to the system at least once a day, however, as the semester progressed, the frequency of students' interaction with the **Talk** system increased substantially.

We posted problems or challenging questions to the bulletin board and asked the students to provide answers. The questions we posted were not necessarily like homework questions but the kind of questions that required students' own input and insight. Sometimes a solution to a given problem was posted and students were asked to comment on it. Students also posted questions and

responded to each others' questions. In addition to questions, items of general interest as well as material about the course, such as course outline, semester schedule, project description, etc., were posted to the bulletin board.

Since ease of use was on top of our priority list, we developed a simple menu-driven user interface. The advantages of a menu-driven interface are (Shneiderman 1986):

- Students need not know the names of individual commands. They are always presented with a valid command list.
- Typing effort is usually minimal.
- Context-dependent help screens can be provided because it is straightforward to keep track of the student's context and to link the system with a help system.
- Students may not enter into an erroneous state.

Talk's interface consists of a series of menus. These menus allow a student to: (a) select a conference topic, (b) read messages posted for the chosen topic, (c) add messages to the bulletin board related to the chosen topic, (d) reply to a given message, and (e) activate the electronic mail facility for private communications. Other smaller options are not listed here.

ACTIVE PARTICIPATION IN COURSE TOPICS VIA INTERACTION WITH THE CAI SYSTEM

The Talk system was used in a software engineering class that met twice a week. Using this experience, we discuss the potential effectiveness of the Talk system (and other similar CAI systems) in providing an environment for students' active participation. The discussion is based on our intuitive observation and study of students' behavior as well as an informal survey that we have conducted. Thirty-five students, ranging from sophomores to seniors, participated in the survey. There were two main survey questions:

1. What are some reasons that discourage you from actively participating in the classroom discussions?
2. What are some reasons that motivate you to contribute to a discussion topic on a system such as the Talk system?

Other questions on the survey were related to students' background such as classification.

To discuss the effectiveness of the Talk system in encouraging students to engage in course topics more effectively, we must first consider the reasons why some students are hesitant to speak during a regular class period. The following is a partial list of such reasons which we have learned through our observation and from the survey we conducted:

- Students cannot immediately compose/form their comments and/or questions in the classroom,
- Students frequently are under the impression that what they want to say may not be correct,
- Students may be tired (after a long day, or a sleepless night) and thus unwilling to talk in the classroom,
- In the classroom, there is not as much time for thought or digression,
- The instructor is always right (a "superior" not an "equal" entity) or does not want to admit that he or she is wrong,
- Some students are "shy" and are uncomfortable talking publicly,

- Fear of interruption discourages some students from talking in the classroom, and
- Some students are insecure about their voice or may consider the classroom as a threatening environment.

We now briefly discuss several features of the Talk system's interactive environment that helped eliminate many of the above obstacles. These features together encouraged students to more actively interact with the Talk systems and, in essence, participate in course topics.

First, the Talk system provides an interactive environment in which one can state his/her views, comments, responses, and so forth, without fear of interruption. In other words, no one is going to leap into a student's editor and cut him/her off or render one of his/her statements incomplete and therefore not representative of the student's true thought to the classroom audience.

Second, the conferencing system is a less threatening atmosphere than an open classroom. It provides a "security" blanket to those who like to express themselves but would be hesitant to do so in classroom. Text-based communication (as opposed to verbal communication) overcomes a lot of fears some "tight-lipped" students may have about their own voices.

Third, the students can compose their messages, questions, or comments at their leisure and make sure that they are saying what they want to say in a clear manner without mistakes. The students can fully edit their message/reply.

Fourth, as mentioned earlier, students are allowed to post questions. Some students feel very positive about providing answers to questions that fellow students have raised. This encourages positive collaboration among the students. This kind of collaboration leads to another reason why students engage more, and that is *reciprocity*. That is, if a student gains from the conference forum, he/she feels obligated to return the favor by sharing information, a concept, or a perspective with someone else.

Fifth, the convenience associated with being able to compose a well thought out question or answer in advance appeals to the "shy" people. The conferencing system lends itself to the interaction that is not available in all classes, unless the instructor puts the class in a circle and operates it as an "open forum."

Finally, because of the openness of the conferencing system, a student can argue confidently. For example, if a student thinks that his/her idea is correct then he/she can "prove" it (for example, by giving citation to literature work). In other words, the student no longer fears instructor's unfounded "superiority" attitude. Before ending the above discussion, two important points must be remembered: First, the availability of an online computer-based conferencing system does not guarantee that students will participate. Usually there are several assertive people (e.g., the instructor and two or three students) who participate in discussions before other less assertive students feel comfortable joining. Second, verbal communication is important. However, our goal has been to encourage the students to more actively participate in course topics to help their learning process. The Talk system has been a successful tool to achieve this goal. (We agree that the ideal goal would be to encourage students to talk in the classroom.)

AN OVERVIEW OF THE TALK SYSTEM

In this section we'll give a brief description of the Talk system's interactive interface. For the sake of brevity, we ignore those aspects of the interface that may not be crucial to its evaluation. The Talk system's main menu has the following options in it: (a) Conferencing Subsystem, (b) E-Mail Subsystem, and (c) Exit. From this menu, a student may choose the Conferencing Subsystem or the E-mail Subsystem. The Conferencing Subsystem is explained below. The E-mail Subsystem provides a facility similar to the traditional electronic mail systems. In addition to these two functions, this menu (as well as other menus) provides a help facility as well as the current time and other information to help a student use the system.

Once a student chooses the Conferencing Subsystem, a menu with the following options appears: (a) Conference ID and Topic (at any given time, up to nine conference topics are shown on the screen), (b) Move Down the Selection, (c) Move Up the Selection, and (d) Exit. The above menu shows the conference identifiers and topics, and allows moving up/down the selection list, and exit from the menu. From this menu, a student can choose a conferencing topic that he/she is interested in. Once a student chooses a conference topic, the following options are shown: (a) Add Message(s), (b) Read Message(s), and (c) Exit.

Choosing the Add option will result in a menu with the following requests: (a) Enter Message Subject and (b) Enter File Specification. This menu allows a student to enter the topic of the message as well as the file where the article resides. The subject line is limited to 80 characters. Once these two steps have been completed, the message will be added to the system. The Read option (or message selection) allows a student to read existing messages (articles) and reply to them. It has the following information: (a) User ID, (b) Message Topic, and (c) Message Date. It shows a message identifier, user's identifier, message topic, and the date it was posted. User ID is the ID of the person who posted the message and is normally a user's login ID. It can, however, be replaced with his/her real name. Once a message is selected, it will be shown on the screen. The user must press the space bar to get the next part of the message if it is larger than one screen. While reading a message, a student can send a reply directly to the author of a message or post the reply to the bulletin board for everyone to see.

The Talk system employed two different machines, a DecStation 5000 running Ultrix (BSD 4.3 UNIX compatible) and a DEC VAX 8650 running VMS. The DecStation was used to run the server program and the

client programs resided on the DEC VAX system. The server program contained about 400 lines of C code. The client program contained about 1,050 lines of C and Pascal code. (Pascal was for most of the code. Language C was for the communication routines and some miscellaneous support routines.) The purpose of the server program was to collect different messages and post them to the bulletin board at each client's local memory, thus simulating a single bulletin board.

Both the server and client were written using the BSD socket interface to TCP/IP network services. We designed a protocol for exchanging information between the server and client. All messages in the conferences are stored with the server. The client is just an interface that allows the user to access the server.

CONCLUSION

It has been our aim to develop a system that encourages students to become more actively involved in the course topics. The Talk system has been a successful experience in achieving this goal and has provided other features that are very valuable. Its development and usage have been a learning experience for us, and we hope that this paper provides a few suggestions to those who are considering using computers as a means to encourage students to more actively participate in course discussions.

Acknowledgment. This research was partially supported by a grant from the University Committee on Advancement of Teaching, University of Nebraska at Omaha.

REFERENCES

1. Hiltz, A. and M. Turoff. "The Evolution of User Behavior in a Computerized Conferencing System," *Communications of the ACM*, 24:11, 1981, pp. 739-751.
2. Licklider, J. "User-oriented Interactive Computer Graphics," in S. Treu, Ed., *User-oriented Design of Interactive Graphics*, ACM/SIGGRAPH, 1977, pp. 89-96.
3. Sarin, S. and I. Grief. "Computer-based Real-time Conferencing Systems," *IEEE Computer*, 18:10, 1985, pp. 33-45.
4. Shneiderman, B. *Designing the User Interface*, Addison-Wesley, 1986.
5. Welsch, L. "Using Electronic Mail as a Teaching Tool," *Communications of the ACM*, 32:2, 1982, pp. 105-108.