

Collaborative Distance Education on the World Wide Web: What Would That Look Like?

Paul G. Shotsberger, Karan B. Smith, and Christopher G. Spell

*Mathematical Sciences Department
University of North Carolina at Wilmington*

Abstract

This paper suggests a possible application of the World Wide Web for distance teacher training in the area of mathematics education. INSTRUCT (Implementing the NCTM School Teaching Recommendations Using Collaborative Telecommunications) is designed to introduce secondary mathematics instructors to the *Professional standards for teaching mathematics* (NCTM, 1991) while fostering a sense of community among teachers who are physically removed from each other. Emphasis is placed on blending synchronous and asynchronous technologies to facilitate sustained interaction and real-time application of concepts. Options contained within INSTRUCT include a hypermedia version of the Professional Standards for Classroom Teaching, links for connecting to on-line educational resources, the ability to attend synchronous meetings with other INSTRUCT users, opportunities to join in asynchronous discussions, and general access to the Internet. Three key research questions concerning this type of technology are discussed: The amount of face-to-face training required for teachers to become comfortable using INSTRUCT, the extent to which collaboration features of INSTRUCT must be formalized to ensure involvement by participants, and whether use of INSTRUCT can foster among teachers a sense of self-worth and community resulting in lasting change in practice.

Keywords — collaborative telecommunications, distance education, secondary mathematics, teacher training, World Wide Web.

1. Introduction

The Internet has existed in various forms since the late-1960s. However, it was only with the development of the World Wide Web (WWW) and the subsequent introduction of graphical browsers such as Mosaic and Netscape that the Internet moved from being a text-

only communications tool to being a powerful multimedia platform whose potential applications are still being investigated (Schatz & Hardin, 1994). Among these applications, the WWW sites dedicated to instruction are generating new interest in the uses of computers in distance education. In many cases these sites merely represent classroom materials, such as syllabi or class notes, which are available as an outside resource to students enrolled in a course. However, there are at least a few WWW sites offering individuals the opportunity to complete a course remotely, without the need for attendance in class. As these sorts of applications are contemplated, we believe it is essential to include a consideration of the collaborative learning tools that will provide necessary interaction and foster a sense of community for those individuals isolated by geography or other constraints.

2. Background

The focus of this paper is on the use of WWW for distance teacher training, specifically in the area of mathematics education. Teachers in North Carolina, as in many other states, are required to participate in inservice staff development as a part of a licensure renewal cycle which repeats every five years. This training normally takes the form of workshops conducted at a single site over the course of several days or even several weeks, typically during the summer months. Drawbacks to this type of staff development include the time and money required for travel to the training site; the artificiality of training done in isolation of the classroom, wherein teachers must wait until the school year begins again to apply their learning; the logistical problems of attempting to support teacher change once teachers have returned to their schools; and the difficulty inherent in trying to keep teacher training current in a discipline such as mathematics education where knowledge and practice are rapidly evolving.

Various distance education solutions proposed for use in teacher training have addressed the above shortcomings. Mayes (1993) developed a series of master's level math courses that were transmitted via a two-way satellite link to teachers at statewide regional sites in West Virginia. Knapczyk (1991) has reported on a distance system for training teachers to manage at-risk students which provides an audiographic link via telephone lines between groups of participants. Both of these projects were able to overcome many of the difficulties of face-to-face instruction, including travel and associated costs, while fostering a sense of collaboration among teachers. Yet, the present authors do not feel that the full potential of telecommunications for teacher training has even begun to be tapped. As Knapczyk (1991) states:

Improving the skills of personnel already teaching in elementary and secondary public schools requires that universities generate new approaches to their K-12 staff-development activities. (p. 68)

In the spirit of this recommendation, we have begun exploring the use of WWW for teacher training. Using this technology, training and support would be available to teachers at their schools during the school year, and the on-line training and resource materials could be updated on a continual basis in order to maintain teacher awareness of current trends. Further, we believe that sufficient interactivity can be built into the system so that teachers will feel that they are a part of a community of educators despite potentially being the only workshop participant at their school.

3. The Design

The distance teacher training system we are developing is a Mosaic page called INSTRUCT, which stands for Implementing the NCTM School Teaching Recommendations Using Collaborative Telecommunications. The initial target population for INSTRUCT is secondary mathematics teachers, but it is our desire that the training resources available through INSTRUCT would eventually be appropriate for K-12 teachers involved in mathematics instruction. Brush, et al. (1994) has identified some important aspects of distance performance support systems intended for use with practicing teachers:

...a support system for distance instruction would need to aid in the delivery of the content of the training, to provide a mechanism for interaction between instructors and students, to offer options for feedback about assignments and projects, and to give the program staff alternatives for

evaluating the training and maintaining quality control over activities. (p. 39)

Guskey (1986) elaborates on the need for promoting interaction among participants involved in training, noting that most teachers require the opportunity to share ideas and concerns with others before making changes in their instructional practices.

INSTRUCT's design therefore integrates aspects of groupware, or software intended to support group interaction, to expand its use beyond being simply a storehouse of instructional material. Johnson-Lenz and Johnson-Lenz (1991) have suggested that groupware attempt to strike a balance between supplying mechanisms for encouraging interaction and providing open spaces within which participants determine the types of interaction that take place. As Mandviwalla and Olfman (1994) suggest, users should also have the capability to meet synchronously or asynchronously, as appropriate, and the tools for carrying out these interactions should be contained in a single system.

Following is a listing of the options available through INSTRUCT with a description of their function:

A. A hypermedia version of the NCTM Professional Standards for Classroom Teaching found in the *Professional standards for teaching mathematics* (NCTM, 1991)

This choice will link the user to a Mosaic page with the following menu items: Worthwhile mathematical tasks, Teacher's role in discourse, Student's role in discourse, Tools for enhancing discourse, Learning environments, Analysis of teaching and learning. Each of these sub-menu items will lead to other Mosaic pages which employ text, images, audio and video to provide the user with a multimedia introduction to the NCTM standards for classroom teaching. Each sub-menu page will contain its own "Check for Understanding" form for the user to fill out and submit electronically to the training coordinators for assessment of the user's mastery of a particular standard.

The NCTM *Professional Standards* includes vignettes intended to act as exemplars of the standards in practice. Similarly, INSTRUCT will provide the user with multimedia vignettes to enhance and clarify presentation of the training material. Teachers will be given the opportunity to be involved in the project as contributors of pictures, audiotape and videotape of classroom activities for use in multimedia vignettes. The use of authentic classroom materials, such as written records of student problem solutions (Figure 1) or checklists of observed problem-solving behaviors, is intended to make INSTRUCT both practical and

useful for the continuing education and support of mathematics teachers.

Out of a concern for minimizing download time for these large multimedia files, trainees will be given a CD-ROM containing these files which can be accessed through the use of small Toolbook routines contained within INSTRUCT. This will solve the problem of users waiting potentially long periods of time to view multimedia vignettes. Additionally, by tying questions in the Check for Understanding forms to material contained in the CD-ROM, training coordinators can better control teacher access to INSTRUCT for the purposes of receiving licensure renewal credit.

B. On-line educational resources

Choosing this menu item will link the user to a Mosaic page of educational resources currently existing on the World Wide Web, each of which will in turn link users to the desired WWW site. Available sites will include K-12 Schools On-line, NASA Langley Research Center's K-12 Program, U.S. Department of Education WWW Server, and the NCSA Education Program.

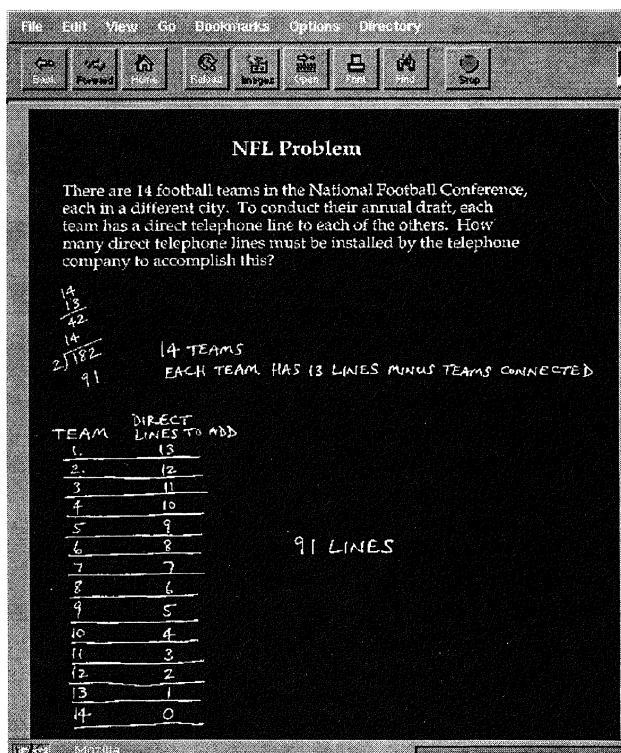


Figure 1. Example of authentic classroom materials available through INSTRUCT.

C. Attend a meeting

This menu choice will provide a telnet connection to a synchronous multi-user dialogue area (e.g., wb or Collage). Meeting participants will have a shared whiteboard and chat box within which they can display and annotate text, images and graphics (Figure 2). In order to promote teacher active participation in and application of INSTRUCT training, trainees will be given assignments to carry out in their own math classes. An intentional by-product of these assignments will be to encourage the need for sustained interaction and collaboration among participants and coordinators (Honey & McMillan, 1994). The meeting option would be particularly useful for INSTRUCT training coordinators to provide additional training materials and commentary to users, for trainees who wish to meet with an INSTRUCT training coordinator regarding their progress, or for users who wish to get together on-line to brainstorm about classroom ideas and plans.

D. Join in a discussion

This option will connect users to a dedicated list server where they can asynchronously communicate with other INSTRUCT users at their own convenience. Scardamalia and Bereiter (1993) urge that for asynchronous communication:

The flow of information must allow for progressive work on a problem, with ideas remaining active over extended periods of time and revisited in new and unexpected ways. (p. 38)

The format being suggested here would benefit teachers by allowing them the opportunity to be involved in more long-term discussions about issues raised in the NCTM Standards, by facilitating the sharing of news and other items of interest between colleagues, and by affording users continual access to previous communications via discussion histories.

E. Send a message

This choice will provide general Internet access for making a meeting appointment, for asking a question of a training coordinator or colleague, or for conducting a database search (e.g., using Gopher).

A long-term goal for INSTRUCT is that teachers would continue to use the program after completion of the Standards training. The menu options for on-line resources, meetings and discussions provide users with

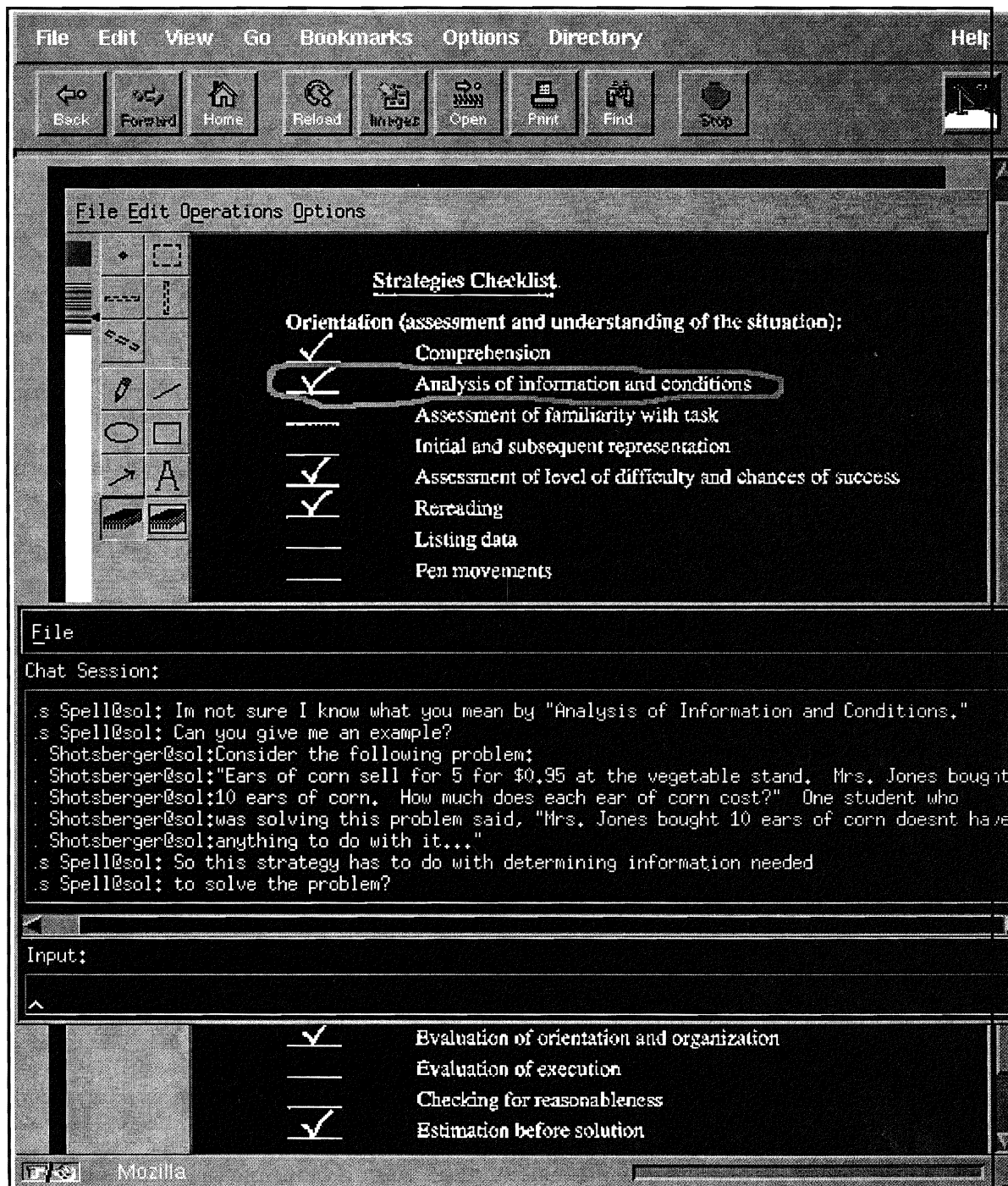


Figure 2. Sample INSTRUCT synchronous meeting.

resources which can enrich classroom teaching on an ongoing basis while providing support for teacher change. Further, an essential feature of Mosaic pages is that they are extensible and easily modified. The developers envision other training modules being added

to INSTRUCT, so that it can grow and change to meet evolving teacher licensure/training needs.

4. Research Issues

There exist many research issues surrounding the use of collaborative tools in distance education. First, it is likely that some of the teachers who would be using INSTRUCT would have no prior experience even with simple telecommunications tools such as electronic mail. Therefore, an essential question to address is the amount of face-to-face training needed to allow trainees to become comfortable with the use of telecommunications in general, and shared workspaces in particular. Likewise, once users are engaged in distance training, INSTRUCT must be able to satisfy a user's need for continued support during the school year. Important considerations are the appropriate mixture of synchronous and asynchronous contact required by users to support their continued use of INSTRUCT, and how comfortable users are expressing their feelings and opinions about making changes in their classroom instruction as a result of training.

A second area of concern is the extent to which collaboration features of INSTRUCT must be formalized to ensure involvement by the participants. Research on computer tutors and microworlds indicates that if the use of options for investigation and experimentation depends on user initiative, it is likely the tools will not be employed (e.g., Lewis, Bishay & McArthur, 1993). Similarly, there is a concern that allowing INSTRUCT users too much freedom with regard to scheduling synchronous meetings or being involved in asynchronous discussions will result in under-utilization of the collaborative aspects of the program. The question then becomes how much formalism need be imposed on the INSTRUCT environment by the training coordinators, and to what extent this formalism needs to be tailored to individual users.

One of the direct benefits of face-to-face training is the sense of community and self-worth teachers derive from taking part in professional training with colleagues from other schools. Therefore, a third research issue revolves around the question of whether use of INSTRUCT can foster among participants these critical components of effective teacher training. We believe that inclusion in a virtual community of professionals through participation in this unique brand of distance education will result in a reduced sense of isolation and increased self-esteem. Further, participants will be encouraged to apply their training over a longer period of time, resulting in more enduring change in their instructional practice.

These issues provide a notion of the key questions that need to be considered. Collaborative distance education offers new teaching opportunities and a vast, rich arena for research. INSTRUCT will possess the capability for recording user protocols and discussion histories, and this information combined with teacher interviews and questionnaires should begin to address these and other issues.

5. Summary

Mosaic and WWW hold tremendous potential for easily accessible, up-to-date training and support of teachers. INSTRUCT employs this new distance education technology for introducing secondary teachers to the NCTM standards for classroom teaching, while providing a framework for collaboration with colleagues and resources to promote lasting change in their instructional practices.

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