Chronicles of Teaching: Using Computer-Based Communication to Tell Stories and Reflect About Teaching

Wayne A. Nelson
Department of Educational Leadership
Southern Illinois University at Edwardsville
Edwardsville, IL 62026
(618) 692-3586
wnelson@siue.edu

Randall E. Smith
Department of Curriculum and Instruction
Southern Illinois University at Edwardsville
Edwardsville, IL 62026
(618) 692-3434
resmith@siue.edu

Abstract: In recent years, research in teacher education has focused on ways to promote reflection by beginning teachers. The research project described in this paper elicits the help of hypermedia computer technology to encourage and facilitate communication among teacher education students, as they develop abilities to view classroom situations from multiple perspectives, suggest alternative explanations of classroom events, and use theoretical principles to support or evaluate decisions.

Conceptions of teaching, especially outside the profession, often maintain simplistic and narrow beliefs that teaching is a skill that can be acquired relatively easily by any reasonably intelligent individual. However, learning and development theories suggest that a complex skill like effective teaching is acquired over thousands of hours of practice [Norman 1978]; practice that includes autonomy, collaboration, and time [Wildman & Niles 1987a]. Recent research in teacher education has stressed reflection as an important component of this learning process [Ross 1989; Schön 1991; Wildman & Niles 1987b]. Helping beginning teachers learn to think about and analyze their pedagogical activities is seen as an important step in developing effective teachers.

One of the difficulties that beginning teachers face is to discover the practical theories and principles that ground their knowledge of the complex situations inherent in the act of teaching. Reflection provides a way for beginning teachers to develop abilities to "make rational choices" about how to proceed in the classroom, and "to assume responsibility for those choices" [Ross, 1989]. Theoretical models suggest that five elements are common to the reflective process: (1) *recognizing* a dilemma; (2) *responding* to the dilemma based on recognition of similarities and differences with other situations, as well as the unique aspects of the current situation; (3) *framing and reframing* the dilemma in various ways; (4) *experimenting* to discover possible alternative solutions, and; (5) *examining and evaluating* the desirability of possible alternative consequences for various solutions [Goodman 1984; Ross 1989: Zeichner & Liston 1987]. The development of reflective practice is influenced by the practitioner's values, knowledge and practices, which determines the types of problems that will be recognized, how the problems will be framed and reframed, and the solutions that will be generated [Schön 1983]. It has been suggested that mature reflection is dependent on the ability to view problems from multiple perspectives, to generate alternative explanations for events, and to use available information to evaluate a decision [Kitchener & King 1982].

In response to the need to establish connections between the theories of education discussed in the universities and actual practices of teachers in the classrooms, many teacher education programs have incorporated case methods to encourage reflection by beginning teachers [Shulman 1986]. Case methodology is a proven instructional strategy used in many disciplines, most notably law, medicine and business [Williams 1992]. Many hold the belief that case-based instruction for teachers can help them to better reason about and

reflect on their practice [Christensen 1987; Schön 1983]. Stories about teaching are a common means of communication between teachers, a valuable source of data for research on teacher education, because stories represent a powerful knowledge representation for teachers [Carter 1993]. A number of projects developing and using case materials have been undertaken [Greenwood & Parka, 1989; Kowalski, Weaver & Henson 1990; Silverman, Welty & Lyon 1992], while others are advocating the use of student-written cases as a means of encouraging beginning teachers to reflect on pedagogical issues [Kagan & Tippins 1991; Shulman 1991].

So what has computer technology got to do with reflection and case-based instruction? While computer technologies may not be necessary or useful for all phases of the reflective process, emerging technologies focused on computer-supported cooperative work and computer-supported collaborative learning (CSCL) have proven to be valuable aids in facilitating and augmenting interactions between group members [Koschmann 1993/1994]. In essence, such systems can facilitate new forms of conversational activities that support instruction and augment traditional classroom discourse [Pea 1993/1994]. Such conversations may help to establish "knowledge-building communities" of learners who share ideas, negotiate meanings, and construct their own knowledge through interaction with others that is facilitated by computer technology [Scardmalia & Bereiter 1993/1994]. Hypermedia architectures for CSCL systems may also contribute to an enhanced environment for learning that allows users to construct their own knowledge, rather than merely being "presented" information that someone else has organized in a hypermedia document [Nelson & Palumbo 1992].

With this theoretical basis, *Chronicles of Teaching,* a hypermedia computer system that featured prespecified stories for analysis, along with facilities for linking various aspects of one story to other stories, was developed and tested. As an initial activity related to their observations in the schools, beginning teacher education students were encouraged to read and react to stories that had been "seeded" in the database. But an important capability of the system was that these students could also use the system to enter and link new stories describing what they saw in the classrooms. The goal of the research and development efforts associated with *Chronicles of Teaching* was to determine whether the system could effectively support the kind of knowledge acquisition and reflection necessary to develop sufficient pedagogical knowledge in preservice teachers. The formative testing of the software was conducted to both describe the kinds of activities undertaken by the students when using the system, and to explore various strategies for integrating the system into a typical teacher education curriculum.

The Software

The *Chronicles of Teaching* software is based on a design that encourages users to read and react to stories that describe real classroom situations. Users may enter their opinions about the problem, the solution, or the alternatives suggested by other users. In addition, users can enter descriptions of situations that they have observed during their field-based activities. As a part of this process, users create their own hypermedia links between their story and other stories or theoretical descriptions that are found in the database. In this way, users must reflect on the similarities or differences between their story and other stories in the database (or descriptions of theories and methods of teaching), and establish links so that subsequent users may follow the links when examining the stories and theories in the database. Another feature that encourages reflection is a "notes" facility that can be used to create and print personal notes. The software also includes extensive search and indexing features so that the stories and theoretical descriptions can be easily accessed.

The structure of the *Chronicles of Teaching* system centers around two database modules (Stories and Theories) that provide search and indexing facilities to aid the user in navigation. The "Stories" module allows the student to enter descriptions of problems or activities that were noticed during classroom observations. Users enter descriptions of both the incident and the resolution of the situation, and may also leave comments or suggested alternatives to stories entered by others. Descriptions of the learning and/or instructional theories underlying the events depicted in the stories are also available. At any time, users may view descriptions of various theoretical principles drawn from the literature on learning, instruction, and effective teaching. The user simply selects the desired theoretical description from a list of descriptive titles. Users are encouraged to engage in debates/analyses of the stories, using the "opinions" feature to pose questions or leave comments for other users. Multimedia capabilities to display video clips of actual teaching episodes are also available to users. These video segments illustrate various features of some of the stories and theoretical descriptions in the database.

The search facilities provided in the software are designed to allow easy access to both stories and theoretical descriptions. Searching for particular stories can be accomplished in several ways. First, the user can access a search facility that "filters" the available stories based on category selections made by the user, including categories such as grade level, subject, and type of teaching activity. Each story in the database also includes keywords entered by the author of the story that describe various topics related to the story. Users may access a search facility for these keywords that will sequentially display all stories where a match to the specified keyword is found.

The hypermedia links embedded in the text of the story descriptions and solutions also provide an important facility for accessing stories. Users may click on a highlighted word, and the system will display the related story or theoretical description. The software provides capabilities for authors to create hypertext links from various words or phrases in their story to other similar stories or theoretical descriptions, thereby helping them to actively reflect on how the events they have observed in classrooms are similar to, or different from, other situations described in the database. Users can easily create links by highlighting a word or phrase in the story narrative, navigating to the target story, and making a selection from the menu to create the link. Links can also be deleted by the author of the story, but once the author is satisfied with the story and links, the story is "published" so that other users cannot alter the author's story description or links.

Field Testing

Development of the *Chronicles of Teaching* software proceeded using a rapid prototyping model. That is, more than 250 teacher education students from the target population participated in several cycles of testing and revision of the software. Initially, randomly selected students from sections of a teacher education program who had completed 16 hours of course work in education (Introduction to Education, Educational Psychology, etc.), and who were entering a "block" of methods courses in elementary education that required extensive observation in public school classrooms (20 hours per week), helped with testing of the various prototypes. Participants were introduced to the system and to story writing and analysis procedures during a training session prior to their scheduled observations in the schools. The students then used the system individually during the remainder of the semester to enter and link stories and solutions based on their classroom observations.

The major activities completed by each student included: (1) responding to other stories by viewing and commenting on analyses made by previous users; (2) composing and entering their own story derived from their classroom observations, and; (3) linking various terms in their story to other stories and theoretical descriptions included in the database. A total of 45 stories were available for viewing, including seven new stories that were entered by students during the prototype testing. The system was instrumented to collect data regarding the specific activities each user completed during interaction with the system. A summary of the kinds of activities undertaken by the students who tested the prototypes is given below [Tab. 1]. It is interesting to note that searching for stories of interest to the students and reading analyses of the stories dominated the interaction patterns. Apparently, students were comfortable with procedures for searching the database, but since most had not encountered hypermedia links before, they did not take advantage of the navigational opportunities provided by this feature of the software.

Activity	Time (in minutes)
Average total time spent with system	40.47
Average time viewing stories	2.72
Average time viewing analyses	9.77
Average time viewing and writing opinions	3.69
Average search time	9.55
Average time viewing theories	5.56
Average time creating and following links	0.23

Table 1: Average times for various user activities.

Feedback from the students who tested the system was used to guide modifications and enhancements of the prototype. Specifically, users of an early version of the software asked for a more sophisticated search

system that would allow them to search for stories based on various categories of teacher activities (i. e., discipline, instruction, classroom management, etc.) as well as student level (i. e., early elementary, middle school, high school, etc.) and context (i. e., math, reading, science, recess, etc.). This search feature was added to the system, along with navigation capabilities that allow users to "backtrack" along the path they had followed while browsing with hypertext links. Examination of the logs of user activity revealed that students tended to search for stories related to discipline, classroom management, and learning, with "All Topics" being frequently chosen as a default search technique to avoid unsuccessful searches for other topics and categories [Tab. 2].

Search Key	Frequency
Early Primary	1
All Topics	26
Discipline	47
Instruction	8
Learning	27
Management	29
Development	2
Assessment	14

Table 2: Search keys used to find stories in the database.

A more extensive analysis of the stories entered during testing of the prototype reveals that the students noticed and discussed a wide variety of classroom situations in the classrooms. An examination of the topics for the stories entered in the database reveals that discipline (45%) and instructional methods (32%) dominated the concerns of the preservice teachers who tested the prototype, while the context of the incidents was more diverse, covering social studies, math, special education, science, history, language arts, health/physical education, and even recess.

Besides specific suggestions regarding modifications of the system, students also volunteered their subjective impressions, noting that the tasks required to use the system were very appropriate for reflecting on various aspects of teaching. The activities involved in entering, linking, analyzing and commenting on stories in the database seemed to engage the students at a high level. It is also apparent that the system encouraged the kind of reflective thinking necessary to develop teaching expertise, as exemplified by the following excerpt from an opinion entered by someone in response to a story:

> I think proximity would be the best in this situation. By moving closer to the students and standing next to them, they will know that they were heard. Some teachers may separate them, but this causes disturbance to the lesson flow. I would continue the lesson while moving towards the student.

Integration into the Teacher Education Curriculum

The *Chronicles of Teaching* software has been integrated in several of the courses in our Elementary Education program. All elementary education majors are involved in four stages of utilization of the software. In the first stage, students enrolled in the Foundations of American Education course (the initial course for all education majors) are introduced to the software through discussions of the stories already in the database. The software is demonstrated by the instructor during classes, and students are encouraged to browse through the databases and enter opinions and alternative ideas for solutions of the problems described in the stories. After the introductory course, elementary education majors enroll in a general methodology course where they are required to write a description of a situation they observed during their field work in the public schools. The students enter and link their story in the database and continue to examine the other stories that are already entered in the database. The third stage of integration of the *Chronicles of Teaching* software into the teacher education curriculum occurs in several of the five methods courses that students must complete. For example, in the Social Studies Methods class, students are required to write descriptions of two situations they observed during their 100 hours of classroom experiences completed during this block of the program. The last stage of

curriculum integration takes place during student teaching. All elementary student teachers are required to write a story describing a situation that occurred during their student teaching and place it in their final senior student teaching portfolio, as well as enter the description and analysis in the *Chronicles* database.

Conclusions

Initial testing of the *Chronicles of Teaching* software has produced encouraging results, suggesting that the activities associated with using the software in combination with the other, more common activities of a teacher education curriculum have succeeded in engaging our students in significant reflection about teaching. Some modifications of the system have been suggested by students as a result of the pilot testing described here. Our experiences have also revealed interesting problems with integration of the system into the existing curriculum that will need to be addressed as the software is used more widely within our program.

Modifications of the software will continue as the system is integrated within our teacher education curriculum. The initial prototypes have been "stand-alone" systems, but it will be necessary to develop an application that can be placed on a network so that the databases can be accessed by multiple users at the same time. We also have plans to provide facilities that allow users to add digital video clips of teaching episodes to the system. Ultimately, we plan to "press" a generic version of the software on CD-ROM, providing a set of initial stories for analysis, theoretical descriptions of learning and instruction, facilities to create and link new stories, and several "movies" illustrating various teaching activities.

It is clear that our students, like so many beginning teachers, tend to focus on discipline and classroom management concerns. If the *Chronicles of Teaching* software is to be more than just a tool to collect and distribute "war stories", it will be necessary to encourage students to notice and reflect on other kinds of situations that occur in classrooms. This will have to be left to the professors teaching the various education courses, as the software exists only as a tool to facilitate communication and reflection. It will also be necessary to achieve an appropriate integration with other reflective activities commonly used in teacher education programs (i.e., journals, discussions, etc.), in order to assure that the *Chronicles of Teaching* software does not merely represent a novel, yet isolated activity that our students must complete in order to obtain a degree. We believe the potential exists for the software to make a significant contribution toward the development of effective teachers. But as always, the successful integration of a technology such as *Chronicles of Teaching* into a curriculum hinges on whether the system is viewed as an integral part of the overall program, rather than another requirement that is detached from the real business of learning to teach.

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