

Computer Conferencing and Collaborative Writing Tools: Starting a Dialogue About Student Dialogue

Curtis Jay Bonk¹ and Kira S. King²

¹*Department of Counseling and Educational Psychology*

²*Department of Instructional Systems Technology
Indiana University*

Abstract

Calls for a more "learner-centered" curriculum is heard from the pulpit of most educational reformers of the 1990's. In response, this paper explores the Collaborative Writing (CW) tools available for different levels of electronic interaction that might be indicators of high quality social interaction. In a series of studies starting in late 1993, a research group at Indiana University began to demonstrate how different CW tools and formats impact social interaction and learning. This paper discusses these efforts in terms of the age level of participants, tool utilized, and instructional strategy or task. CW tools reviewed here are categorized into five levels ranging from electronic messaging to delayed collaboration tools to brainstorming tools to real-time collaborative writing tools to collaborative hypermedia. Though the review of these tools is important, a survey of coding schemes used to analyze electronic transcripts point to the forms of teacher or peer assistance, levels of questioning, degree of perspective taking, status, content talk, peer feedback, and types of scaffolding available over computer-mediated communication. Transcript codings and findings across these electronic social interaction studies point to some commonalities in effective instructional use of these technologies as well as the means to analyze the salient discourse processes and sharing of meaning.

Keywords — collaborative writing, dialogue, sociocultural theory, computer-mediated communication, computer conferencing.

1. Introduction

Research in the social context of learning has provided substantial support that traditional teacher-centered instructional approaches must be replaced with more active, learner-centered environments (Alexander & Mur-

phy, 1994). As educators push for more active learning opportunities, Vygotsky's (1986) sociocultural theory of cognitive development is rapidly influencing diverse educational arenas. Vygotsky's tenets about learning and development emphasize the importance of social interaction with adults and more capable peers as a means to guide children to developmental levels they might not independently attain (Brown & Palincsar, 1989). Recent CW studies provide support that students' internalize the scaffolding of more capable peers when collaboratively writing (Daiute & Dalton, 1988) as well as the cognitive supports or prompts provided by computer tools (Salomon, 1988).

Though educators are turning to Vygotskian writings to promote the social context of student learning (Tharp & Gallimore, 1990), researchers have yet to make significant inroads regarding how cognitive processes displayed on a social plane become internalized by the participants (Wertsch, 1991). Ideas about student zones of proximal development, scaffolding, and internalization remain difficult to implement. Educational researchers continue to struggle with the new focus on activities and event meanings as the unit of analysis. Analyzing electronic social interaction is no different.

Despite these theoretical struggles, CW and computer conferencing tools clearly can help us create these learning environments. As the formats for electronic collaboration proliferate, computer conferencing has great potential for changing the ways students and their instructors interact with each other and organize their learning processes. To make decisions that productively transform learning environments (Schrage, 1990), therefore, research is needed that records how schools, teachers, and students are discovering, employing, and modifying the numerous new CW tasks and tools.

2. Collaborative Writing Roadblocks

There are a numerous obstacles facing the study of computer conferencing and CW. Researchers, in fact, have just begun to examine the social interaction differences between CW tools such as computer network technologies and traditional writing classrooms (Forman, 1992). Minimal documentation presently exists regarding the differences in communication patterns, teacher roles, or student writing performance across levels of CW tools and tasks. Many questions remain:

- Will CW foster new expectations of teaching?
- What types of writing collaborations are preferable to teachers and students? And when?
- What kinds of CW activities are facilitated by different writing tasks and tools?
- How do students assist each other during CW?

These questions unfortunately are often forgotten when viewing ingenious writing technologies or hearing about the exciting, new features for searching and sharing knowledge. Our research group has attempted to overcome these barriers by demonstrating how different CW formats impact social interaction and learning.

3. A Collaborative Writing Taxonomy

Bonk, Medury, and Reynolds (1994) defined CW as groups of two or more people working in concert on a common text project in an environment supportive of their text and idea sharing. In providing that definition, however, we realized that CW tools currently offer a maze of new communication channels among participants (from one-to-one, many-to-one, and many-to-many) and a range of text support (e.g., electronic mail, delayed collaboration, brainstorming, and real-time text collaboration).

After surveying and testing a number of CW tools, Bonk et al. (1994) attempted to clarify this predicament by designing a taxonomy of five levels of CW tools for school learning (i.e., from electronic mail to real-time text document sharing; see Appendix A) as well as a model of the levels and types of nonacademic writing support tools (Bonk, Reynolds, & Medury, in press). Though many similarities are evident, the diversity of activity settings and coding schemes continues to challenge educational researchers and are roadblocks in movements to reform education from a social constructivist framework. The next section provides the specifics of our CW efforts to date.

4. Researching the CW Levels:

From a series of studies, we have discovered that these tools can: (1) change the way students and instructors

interact; (2) enhance collaborative learning opportunities; (3) facilitate class discussion, and (4) move writing from solitary to more active, social learning. By examining the CW formats used in schools and universities, our research projects to date reaffirm our taxonomy of CW tools used in schools (see Appendix A) and help us refine and reevaluate our coding schemes for CW dialogue. These results should inform researchers, tool designers, and policy makers of the importance of social interaction and dialogue in various CW tools and tasks.

4.1. Level I: Electronic Mail Tools

The **first study** was conducted in a course that was project oriented and met for three hours, once a week. In this course, two professors interacted with 48 students organized into 12 different teams, each working on separate and unique projects. To maintain contact with each student and track their progress, students were required to complete weekly reports and e-mail them directly to the instructors. The instructors then responded to each student with an individualized e-mail message which was coded during the semester. The interaction categories were based on the six "means of assistance" identified by Tharp and Gallimore (i.e., modeling, contingency management, feeding back, instructing, questioning, cognitive structuring; see Tharp & Gallimore, 1988). E-mail was more prevalent in the beginning of the semester and primarily performed a feedback function.

The **second project** analyzed involved a two semester graduate course sequence taught by the same instructor (one course was more hands-on/design related (i.e., hypermedia) and the other was more theoretical in nature (i.e., constructivism)). The first part of the sequence was a discussion class in which class and e-mail participation was graded, while the second part of the course was project-based. Rich data was obtained from following the e-mail conversation for the entire year in order to determine the role it played in the learning environment, the social interactions that occurred, and how this form of computer mediated communication can best be used to support learning. Coding schemes by Tharp and Gallimore (1988) and Granott (1991) utilized for this analysis indicated that E-mail was more prevalent in the design class; however, in each class, the instructor dominated e-mail discussion.

4.2. Level II: Remote / Delayed Collaboration

The **first of many delayed collaboration projects** involved a common and effective on-line communication tool (i.e., the *Internet*) (see Harasim, 1990). In this study (Sugar & Bonk, 1994), "telecommunities" and cognitive apprenticeships (Collins, Brown, & Newmann, 1989) provided students the opportunity to have new "pen pals" and fostered common understandings or new perspectives among

themselves; what Riel (1993) refers to as a global education. The World Forum, developed by the University of Michigan, is an on-line asynchronous telecommunications project designed to give students from six middle and six high school classrooms the opportunity to interact with each other about critical environmental issues. Throughout these interactions, the student groups are assisted by World Forum mentors who question and guide the student groups' understanding of these environmental issues. Tharp and Gallimore's (1988) six means of assistance (noted earlier), Bloom's (1956) levels of questioning taxonomy, and Selman's (1980) degree of perspective taking developmental scheme were used to map out these interactions. In the World Forum component of the World School, students discussed, questioned, and debated with Arctic explorers, mentors, and peers about environmental issues. Student role taking activities within these environmental discussions (students assumed roles of famous people like Professor Stephen Jay Gould and Mr. Richard Leakey) enhanced the degree of perspective taking in their conversations. This finding was interesting since mentor assistance and scaffolding during these exchanges was minimal.

The **second Level II project** discussed here involves a distance learning course entitled, Interactive Technologies for Learning, using picture-tel technologies to deliver the course. Here, the instructors at each site utilized electronic conferencing methods to organize, control, and facilitate electronic discussions and meaning negotiation. The analysis here is used to determine whether the instructors successfully assumed the role of student mentor and guide. Each week, students were involved in discussing the articles for the class. "Starters" were used to summarize the articles and begin discussion of the articles and open questions, while "wrappers" were used to summarize the discussion that took place. During the intervening days, students participated at least once on that conversation. Student VaxNotes were analyzed into categories like questions, clarifications, and answers. In addition, the relevancy of the comment to the topic and contribution to the construction of meaning was noted. Instructor VaxNotes were sorted according to instructional planning, commenting, and guiding.

A **third Level II project** investigated computer conferencing using a new tool, *First Class*, within a computer network. *First Class* allowed multiple users to communicate with each other regardless of time or geographical location, thereby fostering discussion threads on any topic of interest.

4.3. Level III: Real-Time Brainstorming

In Level III, multiple users can simultaneously brainstorm by sending messages to each other. In the only study noted here, we created several teaching dilemma prompts for preservice teachers to resolve electronically while working in subject matter teams (e.g., science)

in either real-time or delayed formats. One class of 30 preservice teachers in an educational psychology class interacted over *VAX Notes* in the Electronic Classroom (EC) (i.e., the delayed, asynchronous setting), while two other classes interacted using "*Connect*" (i.e., the real-time, synchronous setting). Naturally, issues of group size, roles or participant structures, and task requirements (e.g., length) are critical to the effect of these tools. Coding of student dialogue transcripts indicated that role assignment was critical to group intermental processing and attitudes. Whereas the use of the synchronous software tool, *Connect*, increased the range of possible group assignments and interaction patterns, the analyses also illustrated that asynchronous communication (Level II) facilitated more serious and lengthy interactions than those in real-time over a local network (Level III; i.e., synchronous communication). After developing a coding scheme for student-student interaction patterns in CW and electronic mail based on Meloth and Deering (1994), the dialogue transcripts revealed that the delayed collaboration mode resulted in more thoughtful and extended peer interaction patterns.

4.4. Level IV: Real-Time Text Collaboration

Real-time collaborative tools allow students to view changes that peers and colleagues make to a document as they are being enacted (see Level V study below and Appendix A for examples).

4.5. Level V: Cooperative Hypermedia

This final level involves real-time collaboration on a common text or graphics document. The study reviewed here is of a 10th grade English class studying the *Crucible*. The teacher incorporates the use of the real-time collaborative writing tool, *Aspects*, to spur classroom dialogue and discourse. An analysis of low and high participating students indicated that collaborative writing software increased the participation rate of quiet students and, to some extent, equalized student interaction patterns. In this study, students interacted using *Aspects* in the free-for-all text mode, in the chat box, and in building common graphic concept maps or webs of knowledge about *Crucible* characters. On-task behaviors and class discussion were extremely high using this tool.

5. Educational Contribution and Implications

The purpose of this paper is to increase the knowledge base on the benefits and drawbacks of various CW formats by investigating the student dialogue evident in various electronic learning settings. Across these studies of existing CW practices, it is clear that collaborative advanced technologies are important tools for learning. The results indicate that both synchronous and asynchronous computer-conferencing have some ad-

vantages over live discussions of cases. CW findings may alter student and teacher ideas about teaching and learning and offer insight into how to use technology as a tool within a learner-centered environment. In effect, our research team has begun to: (1) illustrate how schools and universities are using CW tasks and tools, (2) **start a dialogue about student electronic social interaction and dialogue**, and (3) catalog and inventory specific social interaction patterns within CW. If social interaction patterns and learner-centered ideas embedded in CW are documented and publicized by this research on CW tools and tasks, we will better comprehend and appreciate the components of this new teaching/learning epistemology.

Bibliography

- Alexander, P. A., & Murphy, P. K. (1994). *The research base for APA's learner-centered psychological principles*. Paper presented at the American Educational Research Association annual meeting, New Orleans, LA.
- Bloom, B. (1956). *Taxonomy of educational objectives; the classification of educational goals, by a committee of college and university examinees*. New York: Longmans, Green.
- Bonk, C. J., Medury, P. V., & Reynolds, T. H. (1994). Cooperative hypermedia: The marriage of collaborative writing and mediated environments. *Computers in the Schools*, 10(1/2); 79-124.
- Bonk, C. J., Reynolds, T. H., & Medury, P. V., (in press) Technology enhanced workplace writing: A social and cognitive transformation. To appear in A. H. Duin & C. J. Hansen (Eds.), *Nonacademic Writing: Social Theory and Technology*. Hillsdale, NJ: Erlbaum.
- Brown, A. L., & Palincsar, A. S. (1989). Guided, cooperative learning and individual knowledge acquisition. In L. Resnick (Ed.), *Cognition and instruction: Issues and agendas* (pp. 391-451). Hillsdale, NJ: Erlbaum.
- Collins, A., Brown J. S., & Newmann S. (1989). Cognitive apprenticeship: Teaching the crafts of reading, writing, and mathematics. In L. Resnick, (Ed.), *Knowing, learning, and instruction: Essays in honor of Robert Glaser*. Hillsdale, NJ: Erlbaum.
- Daiute, C., & Dalton, B. (1988). "Let's brighten it up a bit": Communication and cognition in writing. In B. A. Rofth & D. L. Rubin (Eds.), *The social construction of written language* (pp. 249-269). Norwood, NJ: Ablex.
- Forman, J. (Ed.). (1992). *New visions of collaborative writing*. Portsmouth, NH: Boynton/Cook.
- Granott, Nira. (1991). *Play, puzzles, and a dilemma: Patterns of interaction in the co-construction of knowledge*. Paper presented at the annual meeting of the AERA annual mtg, Chicago, IL.
- Harasim, Linda. (1990). Online education: An environment for collaboration and intellectual amplification. In L. Harasim, (Ed.). *Online education: Perspectives on a new environment*. NY: Praeger.
- Meloth, M., & Deering, P. (1994). Task talk and task awareness under different cooperative learning conditions. *American Educational Research Association*, 31(1), 138-165.
- Riel, M. (1993). Global Education through learning circles. In L. Harasim, (Ed.). *Global Networks*. Cambridge, MA: MIT Press.
- Salomon, G. (1988). AI in reverse: Computer tools that turn cognitive. *Journal of Educational Computing Research*, 4(2), 123-139.
- Schrage, M. (1990). *Shared minds: The technologies of collaboration*. New York: Random House.
- Selman, R. (1980). *The growth of interpersonal understanding: Developmental and clinical analysis*. New York: Academic Press.
- Sugar, W. A., & Bonk, C. J. (1994). *World Forum communications: Analyses of student and mentor interactions*. Paper presented at the Mid-Western Educational Research Association annual meeting, Chicago, IL.
- Tharp, R., & Gallimore, R. (1988). *Rousing minds to life: Teaching, learning, and schooling in a social context*. Cambridge, MA: Cambridge University Press.
- Wertsch, J. V. (1991). *Voices of the mind: A sociocultural approach to mediated action*. Cambridge, MA: Harvard.
- Vygotsky, L. (1986). *Thought and language* (rev. ed.). Cambridge, MA: MIT Press.

Authors' Addresses

Curtis Jay Bonk: Department of Counseling and Educational Psychology, Indiana University, Bloomington, IN, 47405-1006, Email: CJBonk@Indiana.edu; **Kira S. King:** Department of Instructional Systems Technology, Indiana University, Bloomington, IN, 47405-1006, Email: KSKing@Indiana.edu.

Appendix A: Taxonomy of Collaborative Writing Tools

(Bonk, Medury & Reynolds, 1994)

Note: the tools listed below may vary in options such as: text outlining, concept mapping, teacher coaching, dialogue tracking, and maximum number of participants.

Level 1. Electronic Mail and Delayed Messaging Tools: allow users to directly send messages or files from one computer to another using point-to-point transfer or to a centralized server using a store-and-forward strategy; while the latter may be preferred since users can log on and off without losing messages, the former may be more economical in a writing lab; useful for assignment reminders, scheduling, and providing document feedback.

cc:mail (cc:Mail, Inc.)

DaynaMail (Dayna Communications)

Microsoft Mail (Microsoft; Note: also has Level 3 applications)

QuickMail (CE Software; Note: also has Level 3 applications)

Level 2. Remote Access/Delayed Collaborative Writing Tools: allow users to remotely access, update, and control files stored on other computers or stored on a mainframe computer; remote access often requires security clearance; helpful for revision or review of a document.

Bank Street Writer III (Scholastic Software, Inc.)

Carbon Copy (Microcom, Inc.)

Collaborative Writer (Research Design Associates)

For Comment (Access Technologies)

Instant Update (On Technology)

Mark-Up (Mainstay)

Prep Editor (College of Humanities and Social Sciences at Carnegie Mellon Univ.)

Prose (McGraw-Hill Book Company)

SEEN (CONDUIT; provides remote commenting on ideas not completed text)

Screen Share (White Knight Technology)

Timbuktu (Farallon, Inc.)

Level 3. Real-Time Dialoguing and Idea Generation Tools: allow multiple users to simultaneously brainstorm on a topic by sending messages to each other; typically have two windows: a

shared/transcript window consisting of ongoing dialogue and a private screen for creating and editing dialogue; useful for prewriting, idea generation, and post-writing phases of collaborative writing.

Conference Writer (Research Design Associates)

DIScourse (Daedalus Group, Inc)

Group Writer (Sunburst Communications)

Connect (Norton)

Level 4. Real-time Collaborative Writing Tools (Text Only): allow more than one person to work on a document concurrently; changes to a document are immediately visible to all participants; pointing devices allow users to draw attention to particular parts of a shared document while private chat boxes allow for real-time conversation and commenting; useful for text creation and revision.

Live Writer I (Research Design Associates)

Realtime Writer (Realtime Learning Systems; used mainly for Level 3 purposes)

Level 5. Cooperative Hypermedia Tools: most allow document sharing capabilities of Level 4 above but expanded to other features including: hypertext, graphics, video images, music, speech, or animation; typically require sophisticated hardware; useful for most aspects of writing depending on feature.

Aspects (Group Logic)

CSILE (Ontario Institute of Studies in Education)

HyperAuthor (Hypermedia and Cognition Group at Wisconsin)

IRIS Intermedia (Brown University, Institute for Research in Info and Scholarship)

KnowledgeBuilder (Knowledge Builder)

My MediaText Workshop (K-6) or Mediatext (Grades 7 to Adult) (Wings for Learning)