

Teachers' analysis of and support for students' collaborative problem-solving activity: a study in a CSCL environment for understanding sound in physics

Kristine LUND, Michael BAKER, Erica DE VRIES
UNIVERSITÉ LYON2 - CNRS, UMR GRIC - Équipe COAST
Ecole Normale Supérieure de Lyon, 46, allée d'Italie, 69364 Lyon cedex 07, FRANCE
tel : +33 4 72 72 85 38 e-mail : lund@ens-lyon.fr, mbaker@ens-lyon.fr, edevries@ens-lyon.fr

CSCL environments can provide new opportunities for and make new demands on teachers as well as on learners. Although CSCL does not yet have widespread use in the classroom, laboratory studies of the kind we present here can shed light on how teachers can benefit from CSCL environments designed to encourage reflection on their own professional practice. While much is known about how teachers intervene in traditional classroom and tutoring settings (e.g. Douglas, 1991, Fox, 1993, Sinclair & Coulthard, 1975), less research has been carried out on tutoring interactions in computer mediated situations. The generic CSCL environment ConNeCT (Confrontation Negotiation and Construction of Text) was specially designed to promote discussion on a meta-cognitive level (cf. Baker & Lund, 1997, Chi & VanLehn, 1991, Maverech & Light, 1992) between students performing a collaborative text production task. We chose the domain of sound propagation for our study. We show how ConNeCT can provide teachers with a way of (i) studying the *process* by which students collaboratively solve problems in our chosen domain and (ii) reflecting on their own activity. We thus address the following questions within our structured CSCL environment : (1) how do teachers analyze students' collaborative problem solving activity in preparation for tutoring?, (2) how do teachers tutor collaborating dyads? and (3) what is the relation between (1) and (2)?

Our study was designed to answer these questions by analyzing a teacher's annotations of a series of CSCL interaction traces and asking for clarifications through interviews and by automatically tracing to file the ensuing on-line teacher-student-student trilogue tutoring sessions in order to compare the teacher's annotations and goals with what actually happened during the trilogues. The first part of our study took place in the classroom where the students were shown a film on sound and asked to write a descriptive text of a situation concerning two tambourines. On a subsequent day in the laboratory, pairs of students carried out the remaining problem-solving in three phases within the context of ConNeCT. In phase 1, the students expressed their opinions for their own and their partner's text. In phase 2, the students discussed their texts and produced a common text. Then in phase 3, after having analyzed the interaction trace, the teacher tutored the students.

We present an analysis of how teachers analyze collaborative problem-solving interaction traces issued from ConNeCT. We use an example trilogue sequence along with an interaction trace annotated by a teacher to illustrate that despite appearances of the students' final solution, the trace permitted the teacher to see they had not understood an element crucial to the description of sound and therefore was able to tutor them accordingly. We conclude that teachers can gain knowledge on students' conceptions by studying collaborative problem-solving interaction traces and that introducing teachers to a CSCL environment such as ConNeCT can give them information relevant to tutoring. In future work, we intend to explore the use of CSCL environments for promoting reflection on the part of teachers.

- Baker, M.J. & Lund, K. (1997). Promoting reflective interactions in a CSCL environment. *Journal of Computer Assisted Learning* (1997) **13**, 175-193.
Chi, M.T.H. & VanLehn, K.A. (1991). The Content of Physics Self-Explanations. *Journal of the Learning Sciences*, **1**, 1, 69-105.

- Douglas, S.A. (1991). Detecting and repairing tutoring failures. In P. Goodyear (ed.). *Teaching Knowledge and Intelligent Tutoring*. Norwood N.J. : Ablex.
- Fox, B, (1993). The Human Tutorial Dialogue Project, Issues in the Design of Instructional Systems In (eds.) Olson, G.M, Olson, J.S., Curtis, B. *Computers, Cognition, and Work*. Lawrence Erlbaum Associates, Hillsdale, New Jersey.
- Maverech, Z.R. & Light, P,H. (1992). Peer-based interaction at the computer : looking backward, looking forward. *Learning and Instruction*, **2**, 275-280.
- Sinclair J. McH & Coulthard R.M. (1975), *Towards an analysis of discourse*. Oxford University Press, London.