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Help-seeking with a computer coach in problem-based learning : Its interaction with the knowledge structure of the learning domain and the tasks' cognitive demands

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The Problem and its Context

Research on tutoring has shown that the student's interaction with the tutor heavily determines the learning outcomes. In human tutoring, the responsibility of the interaction is shared between the tutor and the student (Chi, 2001). In the case of a computer coach such as the McGill Statistics Tutor, the control of the interaction is put entirely in the hands of the learners. Learners' ability to interact with the system productively therefore represents a critical aspect affecting the learning outcomes. This ability of help seeking (Nelson-LeGall, 1981) has not been well researched from a cognitive science point of view in the context of computer-supported learning (Aleven et al., 2003).

The aims of the present work are to elaborate a cognitive model of help seeking and to examine its interaction with critical aspects of the learning situation. Two studies using discourse analysis methodology are conducted using a formal model of the learning domain.

Methodology

First-level Participants are 20 graduate students from a faculty of Education of a Canadian university. The seven-hour experiment involves working in pairs to solve a very challenging statistics problem (a two-way analysis of variance) for which students don't have sufficient background. A computer coach based on human tutoring, the McGill Statistics Tutor, is available to provide help with every aspect of the task.

Data consist of three complementary sources. The dialogue between the pair of participants as they work on the statistics problem using the computer coach. The interaction with the computer coach is also recorded, in two forms. First, the display of the computer is recorded using a special device. Second, the computer coach keeps a log of some characteristics of every help request made by the students. The students solutions to the problem are also integrated in the database.

Data analysis consists of complementary strategies. Trace analyses of the task performance and the help seeking

process were elaborated. Statistical analyses were also performed..

Results and Discussion

Results show that a help seeking model based on information processing theory is reflected in the data. The components of the model are (1) recognize an impasse, (2) diagnose the impasse, (3) establish a specific need for help, (4) find appropriate help, (5) comprehend help, and (6) evaluate help.

Help seeking interacts with the performance of the task and with the structure of the domain knowledge. Help seeking is intertwined with problem solving ; help is sought to fill gaps in students' knowledge in order to solve the problem. However, student's use of the computer coach is not optimal since they tend to select help at higher levels in the hierarchical knowledge structure while they tend to problem solve at lower levels.

Conclusion

These results have implications for the design of computer coaches and instructional situations. These results help characterize the contribution of the learners to the emergence of more or less contingent tutorial interactions. In addition, identifying key skills that students use in problem-based learning situations is a first step in training and assessing those skills.

References

- Aleven, V., Stahl, E., Schworm, S., Fisher, F., & Wallace, R. (2003). Help Seeking and Help Design in Interactive Learning Environments. *Review of Educational Research* 73, 3, 277-320.
- Chi, M.T.H., Siler, S.A., Jeong, H., Yamauchi, T., & Hausmann, R.G. (2001). Learning from Human Tutoring. *Cognitive Science*, 25, 471-533.
- Nelson – Le gall, S. (1981). Help seeking : An understudied problem-solving skill in children. *Developmental Review*, 1, 224-246.