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An Exploration of Correlative Elements to Support Cognitive Advancement in the Design of Collaborative Learning Tools

Abstract

Cognitive advancement in computer-supported collaborative learning (CSCL) is a broad topic more than developing software tools to promote communications among participants. It is a complex problem involving interdisciplinary research. In order to explore the diverse elements to support cognitive advancement in the design of collaborative learning tools, we have carried out a literature-based analysis of three highly concerned areas in the CSCL field with regard to the improving of cognitive process. In this paper, we described the design and implementation of a conceptual model for supporting collaborative learning by combining the derived elements to support cognitive advancement.

1. Literature Review

The literature review is carried out toward three areas in CSCL field for fostering learners' cognitive abilities: scaffolding social interaction (Resta and Laferriere), building collaborative knowledge (Arvaja, et al.) and assessing collaborative learning (Gogoulou, et al.). Through investigating the existing theoretical and practical methods, we identify the following problems to consider for designing a collaborative learning tool to support cognitive advancement:

- How to describe the learners in a way that is meaningful to the collaborative learning activities.
- How to structure the collaborative learning process for individual learning groups.
- How to monitor the interactions between learners in the collaborative learning process.

2. Our Conceptual Model for Supporting Collaborative Learning

Our conceptual model consists of two components: the basic modules that a collaborative learning tool should comprise and the derived design elements being incorporated in these modules.

There are four modules including establishing learner model, formulating learning strategy, supporting collaborative learning activity, and assessing collaborative learning. The module of establishing learner model is to establish the system's knowledge about the learners, i.e. the information about learners' characteristics and learning behaviors.

The module of formulating learning strategy is to form optimal learning groups for individual learners and recommends optimal learning strategy for individual learning groups. The module of supporting collaborative learning is to scaffold the interactions between learners participating in the learning process. The module of assessing collaborative learning is to monitor the interactions between learners or to assess the learning outcomes of learners.

The design elements derived from the literature-based analysis is composed of six groups of elements. They are individual elements, group elements, contextual resources, educational approaches for assessment, collaborative process analysis techniques, and theory supporting cognitive advancement. These elements are indirectly connected in the sense that the function modules that they support are interwoven.

3. The Implementation Issues

Our implementation of the conceptual model is a multi-agent and wiki based system. The role of the wiki in the system is that it provides a platform for learners to carry out the collaborative learning activities. The multiple agents in the system provide autonomous and intelligent supports for the whole system. For instance, a Group Agent is in charge of monitoring the group learners' behaviors.

4. Conclusion

The proposed model for supporting collaborative learning has advantages in incorporating individual learners' learning requirements, structuring the collaborative learning process and assessing the learners' behaviors for a better support of the system.

5. Selected References

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