Chapter 13
Designing for Reflection: A Case Study with Digital Tabletops and Digital Mysteries

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EXECUTIVE SUMMARY

In this case study, the authors revisit the benefits of reflection for learning and classify three different types of reflection support as evident in the pedagogy literature: post-activity, inter-activity and part-of-activity. They present their design of a collaborative learning application (Digital Mysteries) as implemented on the emerging digital tabletop technology. The design of Digital Mysteries aims at demonstrating the potential of technology for providing support for all the identified types of reflection. The application was evaluated through 12 trials with 6 groups of students 11-14 years old in a school environment. Two of the six groups carried out repeated trials with the goal of evaluating benefits from repeated use and to overcome effects resulting from the novelty of the technology. The trials showed clear evidence of reflective interactions, caused by the application's design, which positively affected subsequent trials. The authors conclude with a number of generalized recommendations for designers of collaborative learning environments.

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ORGANIZATION BACKGROUND

This case study was conducted at Bedlingtonshire Community High School at Bedlington, UK in the context of a larger project that aims to focus on developing enquiry-based teaching, and the capacity of students to act as autonomous learners. Students, 11-14 years old, of different achievement levels participated in the study. The system used in the study was developed as part of a PhD research on digital tabletop technology and its support for collaborative learning at Culture Lab, School of Computing Science, Newcastle University, UK. The emphasis of the system was on utilizing digital tabletops technology to support learning of higher-level thinking and effective collaboration, two skills that are widely identified as essential elements of a modern school curriculum for high-wage, knowledge oriented economies.

Throughout our research, both the affordance of computers to support reflective thinking and the underutilization of such affordances became evident. Detailed study of the different types of reflection that can benefit learning, and the identification of the ways in which computers in general and digital tabletops in specific can support these different types are the main focus of this case study.

CASE DESCRIPTION

Reflection and Learning

The higher level thinking skills targeted in this case study include metacognition and reflection. Metacognition refers to "the knowledge about and regulation of one's cognitive activities in the learning process" (Veenman, Van Hout-Wolters, & Afflerbach, 2006, p. 3). It is considered to be the higher order agent that monitors and controls the cognitive system and be part of that system at the same time. As reported by Veenman et al. (2006), metacognitive skills account for 17% of variance in learning while intellectual ability accounts for only 10%, and both share 20% of variance in learning for students of different ages and backgrounds, and for different tasks. This finding lead to the conclusion that an adequate level of metacognitive skills can compensate for students' cognitive limitations. Such skills can be developed by (1) embedding metacognitive instruction into the learning task design, (2) making students aware of the usefulness of these skills, and (3) prolonged training on these skills to guarantee their application. Moreover, Lipman, Sharp, and Oscanyan (1980) suggested exposure to philosophical discussion as a method to encourage a disposition towards thoughtfulness.