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Title: Co-designing curriculum for smart classrooms

Abstract:

The goal of our project is to Empower teachers to embrace new technologies that turn their classrooms into knowledge communities. Our presentation illuminates the development of an innovative new smartroom at an urban high school in southern Ontario. Key elements of the room include a reconfigurable monitor array, and a touch-surface "smart wall." In order to foster a knowledge community, we co-designed curriculum lessons with a high school teachers that utilize this space, in conjunction with other Web 2.0 technologies such as FlickR or YouTube, to create valuable distributed intelligence and community knowledge through a scaffolded environment.

Introduction

Now more than ever, Canadian schools must prepare students as lifelong learners in a society where change is the only constant. New issues, new opportunities, and increasingly complex range of messages and materials will greet them at every turn. As the Canadian context becomes increasingly diverse, students must become skilled at interacting with peers, solving problems and embracing this complexity. The development of these skills has become a vital piece of an educator's role in the classroom, and the objective of this research is to empower teachers to embrace new technologies that turn their classrooms into knowledge communities.

Inquiry learning often employs technology environments in scaffolding students to respond to problems that go beyond traditional laboratory activities (Collins, 2002; Slotta & Linn, 2000; Soloway et. al, 1999). The notion of "scaffolded inquiry" (Songer, 2007; Linn & Eylon, 2006) is quite relevant to the challenge of engaging students with technologies, particularly as their lives outside the classroom become increasingly immersed in technology (Tinker, 1997; Nirula et al., 2003; Swan et al., 2005). An

even more transformative approach to learning is that of knowledge communities, where students collaborate with their peers and teachers to develop knowledge resources and define their own learning goals (Brown & Campione, 1994, Nirula & Woodruff, 2008; Scardamalia & Bereiter, 1992). This kind of learning complements the foundations of "Web 2.0", which are characterized by socially driven web experiences (e.g., Facebook) or semantically linked resources (e.g., YouTube, FlickR) – where learning becomes a collective product rather than the output of singular minds.

With the arrival of new technologies, which are making headway into Canadian classrooms, the conditions are ripe for the formation of knowledge building communities that bridge classrooms with the world at large. At the heart of this connection between classroom and outside world is the ability to create rich and varied relations between the learners and the objects of knowledge, personally relevant curriculum that promotes deep understanding (Woodruff, 2005; Bereiter, 2002). This paper describes a new program of work that addresses the following research questions: **(1)** What kinds of learning activities are best suited to connecting students' home, school and informal learning environments? **(2)** What new opportunities for teaching and learning emerge from Web 2.0 technologies and approaches? **(3)** How can teachers develop curriculum activities that engage students in knowledge building?

Methods

This design-oriented study investigates new ways in which technology can support communities of learners in dramatic new ways. In close collaboration with a local high school, we are developing a "smart classroom" in several layers, using a range of devices and approaches. At the most basic level is the portal and user registration system, which manages user accounts for each student and coordinates the grouping and collaboration services that are employed by higher level software systems. A second important layer is that of the pedagogical architecture, which represents the logical dependencies,

conditions, and grouping configurations, and links to many different kinds of content materials, devices, and user interface paradigms. This is basically the choreography of our smart classroom, managing the flow of people, roles, goals, materials and devices. A third layer is that of content, which is responsible for storing the actual materials encountered by students, such as written instructions, discussion topics, reflection prompts and notes, or rich media objects (e.g., simulations or models).

The smart room currently includes functionality for a flexible "smart wall" – a large touch-surface of approximate 2 X 3 meters dimension. Students can work collaboratively at the smart wall, jointly manipulating multi-media objects and Internet enabled applications. We also support a flexible array of monitors, and a hand-held (iTouch) enabled pointing device that can interoperate with the Smart Wall. The Smartwall can be configured in 3 arrangements, shown in the Figure. Data sources include pre and post-interviews with teachers about formal and informal learning environments, the use of technology-mediated instruction, and classroom participation. Additionally, we examine the logged student data, all artifacts created by students, and all curricular assessments employed by teachers.

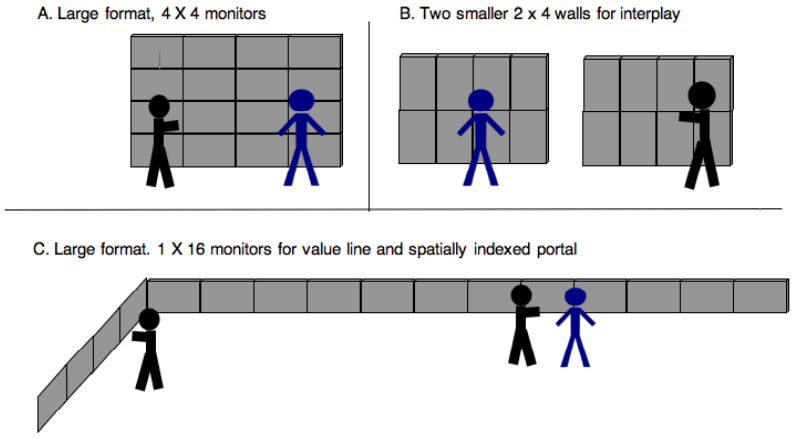

Figure 7. S3 Concept wall in 3 different configurations: A single large wall with 16 monitors, 2 smaller walls with 8 monitors each that permits exchange of digital objects between the two, and one long linear array of 16 monitors that can wrap around a classroom.

Outcomes

In our first year, we have successfully established four curriculum projects with teachers from a variety of domains. Given space constraints, we will describe here only one of the partnerships that

have now been completed. We continue to work with all teachers to revise and improve their innovations. Working closely with a math teacher, we have developed a project where grade 12 students upload math problem descriptions and solutions to FlickR, a popular online image hosting service. All the images are "tagged" by common math terms, as well as social tags, which students can then search, comment, and add to. This gives each student the ability to add to the class knowledge base, as well as to actively participate in the conversation that develops this knowledge. This project demonstrates the capacity of the smartroom to help scaffold distributed intelligence within a knowledge community, including co-design and careful monitoring by both the teacher and the research team.

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