Getting Your Socks Wet: Augmented Reality Environmental Science

Eric Klopfer & Kurt Squire
Teacher Education Department, MIT, Building 7-337. 77 Massachusetts Ave. Cambridge , MA 02139
Tel: (617) 253-2025
Email: Klopfer@mit.edu
Curriculum & Instruction, University of Wisconsin-Madison

Mobile Computing Technologies and Learning

As simulations go from the desktop to portable devices, we hope to harness the unique affordances of handhelds including: (1) portability –can take the computer to different sites and move around within a site; (2) social interactivity – can exchange data and collaborate with other people face to face; (3) context sensitivity– can gather data unique to the current location, environment, and time; (4) connectivity – can connect handhelds to data collection devices, other handhelds, and to a common network; (5) individuality – can provide unique scaffolding that is customized to the individual's path of investigation. A handheld learning environment might capitalize on this ability to bridge real and virtual worlds resulting in augmented reality simulations, simulations that layer virtual context on top of the real world.

Approach: Situated Cognition

Over the past decades, many learning scientists have argued for the importance of understanding cognition in context (e.g. Barab & Kirshner, 2001). Whereas traditional cognitive models treat the workings of the mind as somewhat independent from context, a host of emerging, complementary approaches to understanding cognition treat cognition and context as inextricably linked (e.g. Greeno, 1998). Meaning arises from interaction within the world and within social practice and therefore must be understood within social contexts (Lave & Wenger, 1991). Handheld technologies afford opportunities for creating problem spaces that extend across real and virtual spaces. This study took place within a design experiment (Cobb, et al., 2003) exploring educational augmented reality simulations. In this series of case studies, 75 college and high school students investigated a chemical spill in a local watershed in an activity that lasted 2 hours. The problem, co-designed by environmental engineering faculty, requires students to combine real-world and virtual-world data to determine the cause of the spill and design are mediation plan. Our curricular goal is to give students an experience where they must apply knowledge to devise sampling strategies, manage resources, and experience the socially situated nature of investigations.

Results

Across the groups, five main motifs emerged through discourse: (1) Negotiating the environment in the investigative process; (2) Over-reliance on sampling at the expense of deskwork; (3) Interpreting the problem as gathering information to complete a puzzle; (4) Integrating the real world, and PDA-mediated resources, and (5) Inter-group power dynamics in determining strategies. Students had difficulty thinking across "soft" qualitative information gained in interviews and "hard" quantitative data gathered through physical samples, suggesting that the core problem driving the game is robust and worth further investigation. Groups of college students focused on sampling water quality and gave little attention to interviews. In cases where students were unsure of what a reading meant, their solution was to "dig another well" in the hopes that more "hard data" would solve the problem. A few college groups (typically gender balanced) used both interview and "hard" data to generate effective designs. High school students constructed the central game challenge as one of collecting interviews as one might conduct a scavenger hunt. The difference in how Environmental Detectives was appropriated reminds us of the power of local cultures in shaping tool use. The game was only one object in the activity system and future implementations will investigate additions that might more consistently engage students in scientific problem solving.

References

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