Three Perspectives on Technology Support in Inquiry Learning: Personal Inquiry, Mobile Collaboratories and Emerging Learning Objects

Astrid Wichmann, H. Ulrich Hoppe,
University of Duisburg-Essen, Forsthausweg 2, 47057 Duisburg, Germany,
wichmann, hoppe@collide.info

Daniel Spikol, Marcelo Milrad,
Linnaeus University, Vejdes plats 6, 35195 Växjö, Sweden,
daniel.spikol, marcelo.milrad@lnu.se

Stamatina Anastopoulou, Mike Sharples
University of Nottingham, Exchange Building, Jubilee Campus, Nottingham,
stamatina.anastopoulou, mike.sharples@nottingham.ac.uk

Roy Pea, Heidy Maldonado,
Stanford University, 450 Serra Mall, H-STAR Institute, Stanford, CA 94305,
roypea, heidym@stanford.edu

Ton de Jong,
Twente University, PO Box 217, 7500 AE Enschede, The Netherlands,
a.j.m.dejong@utwente.nl

Abstract: Our hands-on workshop convenes educational designers and learning technology architects to author inquiry learning activities and user experiences. Participants will use a scenario editor to design classroom and field activities based on pedagogical approaches such as personal inquiry. Designs will be implemented using modeling tools, mobile devices and inquiry management tools provided by the organizers. Participants will gain insight into new pedagogical and technological approaches for inquiry learning and discuss implications for their future work.

Introduction
Current efforts in supporting science learning have been focusing on instructional approaches that engage the learner in active knowledge construction and sharing. One approach receiving much attention is inquiry learning. Inquiry learning activities include posing questions, which can be tested subsequently, developing hypotheses, gathering and analyzing data and using newly gained knowledge to form new questions. The challenge of supporting these inquiry activities in computer-based learning environments has been a focus in the Technology Enhanced Learning (TEL) community. The workshop brings together stakeholders of three prominent perspectives on inquiry learning: Personal Inquiry, Collaboratories and Emerging Learning Objects. All three perspectives have been successfully supported by existing environments and tools within the projects: PI (Personal Inquiry), LETS GO (Learning Ecology with Technologies from Science for Global Outcomes) and SCY (Science Created by You). The goal of the workshop is to examine the challenges of putting these perspectives into practice. Based on a graphical language developed in the SCY project, participants will design inquiry activities using the SCY Scenario Editor SCY-SE (Wichmann, Engler, & Hoppe, in press). In a next phase, these activities will be enacted using mobile tools, which are designed for field trips and computer-based tools for the science classroom. Further details on the three science projects are presented below.

Personal Inquiry: Learning Across Contexts
PI explores how to make the processes of evidence-based scientific inquiry personally relevant and readily accessible to young people (aged 11-15 years). It also aims to support the continuity of science learning between classrooms and non-formal settings. Informed by a series of inquiry projects with schools, we have developed a toolkit to support inquiry learning across a range of learning contexts and for many types of device including personal mobile technologies and shared classroom displays (Anastopoulou et al., 2008). The PI toolkit utilizes scripts (dynamic lesson plans) to support multiple ways of interaction including answering questions, predicting, collecting data and reviewing data. The implementation of inquiry learning in the classroom, in the home and beyond has informed the design of the technology and the inquiry activities.
LETS GO: Mobile Collaboratories
LETS GO frames its vision of “open inquiry” as the opportunity to catalyze and sustain global learning using mobile science collaboratories that provide open software tools and resources, and online participation frameworks for learner project collaboration, mobile media and data capture, analysis, reflection and publishing (Lotan, 2003; Pea & Maldonado, 2006). We are integrating geo-location sensing, multimedia communication, information visualization and Web 2.0 mash-up technologies, to create these science learning collaboratories using interdisciplinary research teams (Vogel, Spikol, Kurti, & Milrad, in press). This rich type of technological environment provides an experimental arena for learning about complex topics in science through the process of exploring natural phenomena - as students use sensors and software tools for conducting systematic and collaborative investigations (Novak & Gleason, 2001).

SCY: Emerging Learning Objects
In the SCY project (for more information, see http://www.scy-net.eu), students engage in inquiry learning activities supported by computer tools such as simulations and modeling software (de Jong, Joolingen van, & Weinberger, 2009). In SCY-Lab, the SCY learning environment, students work on missions and meet challenges collaboratively and individually supported by learning material, tools and scaffolds. The construction of artifacts that emerge from the learning process has been articulated as one of the central ideas in SCY. These so called Emerging Learning Objects are re-usable and sharable products of learning activities, which are created by learners. The assumption behind Emerging Learning Objects is that learners create artifacts in partly unanticipated ways in phases of individual and small group work (e.g. Hoppe, 2007).

Discussion
One issue that needs to be considered is the lack of open standards in education technology tools. Each of the different science inquiry-based learning projects presented along with the environments, to a large extent, faces challenges regarding the degree of flexibility that is provided to the teachers as designers of the inquiry activities. Technologies need advanced technical skills that restrict the development of customized and integrated scenarios required for independent adaption by school system. Modular approaches aiming to enable teachers to adopt existing inquiries to their own needs with little or no support from the technical team, might be a useful approach that is yet to be tested. Furthermore, one of the fundamental technical challenges for our different projects is to explore how to create software and hardware solutions for educational uses that can be easily integrated into schools, making the potential of Science 2.0 accessible to students (Dede & Barab, 2009).

References


