Using HP Mobile Technology to Support a Human-Computer Interaction Design Studio[*]

Christopher Hundhausen
Visualization and End User Programming Lab
School of Electrical Engineering and Computer Science
Washington State Universtiy
Pullman, WA 99164-2752
hundhaus@wsu.edu

Executive Summary

Inspired by the design studio commonly used in architecture education, this project will explore a "studio-based" approach to teaching an undergraduate course on human-computer interaction design. In addition to a weekly lecture, the course will revolve around a weekly, 150-minute "design studio" that emphasizes conceptual user interface design activities. Using wireless HP tablet PCs, pairs of students will interact with custom, sketch-based software to construct low fidelity design prototypes that meet the requirements of given design problems. Each design problem will (a) focus on the development of an interface to a specific electronic device (e.g., a VCR) or software system and (b) require students to apply the design processes and principles currently being explored in class. Via a wireless network, student pairs will hand in their design prototypes to the instructor. In "design crits" held at the end of each studio, select pairs of students will use the instructor's presentation equipment to present their designs to the rest of the studio for feedback and discussion. In addition, via the wireless network, students will post their designs to a web-based environment that supports artifact-centered threaded discussions, so that students can view and comment upon each other's designs outside of class.

Teaching and Learning Issues

Contemporary "constructivist" learning theory advocates a fundamental shift in the way we approach teaching. Rather than attempting to transmit expert knowledge to students via passive activities such as lectures, we are instead called upon to develop learning approaches that get students actively involved in the learning process, thereby encouraging them to construct their own understandings of the material to be learned. Active learning approaches are particularly appropriate for courses that teach design principles and practices. Indeed, as architectural design educators have discovered through many years of teaching, design principles and practices are best learned through their application to actual design problems. This entails not only having students construct their own designs, but also engaging students in reflective discourse by having them present their designs for feedback and discussion. This project is important to students and instructors because it addresses the fundamental problem of how to actively engage students of human-computer interaction in the kind of critical reflection and discourse that, according to researchers such as Schon, are hallmarks of design expertise.

Goals, Objectives and Outcomes

Specific outcomes of this project include the following:

1. Through a learner-centered design process, we will develop and pilot test a novel, pen-based software environment that enables students to construct, present, and usability test low fidelity prototypes of user interfaces. Initially, the software will include a design palette that supports the creation of electronic devices. As development progresses, design palette modules that support other user interface genres will be created and plugged in.
2. Through a field study of a pilot course that adopts the approach, we will assess the impact of the approach from the perspective of sociocultural constructivist learning theory, which holds that learning fundamentally entails participating more centrally in a community of practice.
3. Through post hoc videotape analysis of selected pilot course "crit" sessions, we will evaluate the value of our software in mediating educationally-beneficial communication.

This project will ultimately impact student learning by making the processes and techniques of HCI design— including user-centered design, rapid prototyping, heuristic evaluation, and cognitive walkthroughs—more concrete, personally meaningful, and reflective. Students will come away from the course not only with substantial practice in applying the principles and techniques, but also with an ability to engage in reflective design discourse.

Measures

1. In order to document improvements in students' design abilities, we will have a team of experts perform heuristic evaluations of the user interfaces that student teams develop for the capstone design projects. The results of these evaluations will help us assess the quality of students' designs, and hence the extent to which they are learning design skills.
2. We will videotape the "design crits" in which students participate throughout the course. We will develop a scheme for coding the content of "design crits" into mutually-exclusive categories, including "higher order thinking" categories to document evidence of emerging student expertise. Through statistical comparisons of content analyses of successive "design crits," we hope to be able to demonstrate gains in students' higher-level thinking skills.
3. We will administer two standard questionnaires at the beginning and end of the course: (a) the Classroom Community Scale, which is designed to measure students' sense of community, and (b) the Motivated Strategies for Learning Questionnaire, which is designed to measure students' use of learning strategies and level of motivation. These questionnaires will help us to assess the extent to which our approach actually motivates students, and helps them to develop a sense of community.

Project Timeline

1. Using learner-centered design process, develop pen-based software environment that enables students to construct, present, and usability test low fidelity prototypes of user interfaces (June - October).
2. Develop series of studio-based HCI design exercises (September-October)
3. Usability test software environment and design exerices (November-December)
4. Teach pilot studio-based HCI course and collect assessment data (January - May)
5. Evaluate assessment data and publish in computer science education conferences and journals (May - August)

Technology Integration

This project will make use of the HP Tablet Package, which well supports the proposed studio-based approach. The custom, sketch-based user interface prototyping software being developed under this grant will be tailored for the Tablet PC environment. Students will use the wireless capabilities of the tablet PCs both to submit their prototype designs for presentation to the class, and to post their designs on a custom web-based learning environment that supports artifact-centered threaded discussions ("disCourse"; see http://lilt.ics.hawaii.edu/lilt/software/disCourse/). Finally, the presentation technology will be used to facilitate the "design crits" at the end of each studio session.

Course Impacted

This project will impact CS 443, our undergraduate course on human-computer interaction, which is listed as follows in our course catalog: "Concepts and methodologies of engineering, social and behavioral sciences to address ergonomic, cognitive, social and cultural factors in the design and evaluation of human-computer systems."

Course Redesign

In addition to a weekly lecture, the course will revolve around a weekly, 150-minute "design studio" that emphasizes conceptual user interface design activities. Using wireless HP tablet PCs, pairs of students will interact with custom, sketch-based software to construct low fidelity design prototypes that meet the requirements of given design problems. Each design problem will (a) focus on the development of an interface to a specific electronic device (e.g., a VCR) or software system and (b) require students to apply the design processes and principles currently being explored in class. Via a wireless network, student pairs will hand in their design prototypes to the instructor. In "design crits" held at the end of each studio, select pairs of students will use the instructor's presentation equipment to present their designs to the rest of the studio for feedback and discussion. In addition, via the wireless network, students will post their designs to a web-based environment that supports artifact-centered threaded discussions, so that students can view and comment upon each other's designs outside of class.