

Problem-Based Learning in New Media Education: The Case for Human-Computer Interaction

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Abstract

In this paper, we pose and answer two questions that we believe are central to the development of curriculum in New Media programs. First, why should New Media students learn about human-computer interaction (HCI)? We begin by arguing for the importance HCI for students learning to design a variety of digital media. Second, what is the best way to teach students HCI? To answer this question we present problem based learning (PBL) a pedagogical approach that is well suited to developing HCI curricula. The utility of PBL is illustrated with a problem-based scenario that could be used in a New Media class to help students learn about HCI.

1 Introduction

The working definition of human-computer interaction (HCI) used here is that proposed by the Association of Computing Machinery's (ACM) Special Interest Group on Computer-Human Interaction Curriculum Development Group (Hewett et al., 1996); HCI "is a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them."

There is growing interest in HCI among New Media faculty as was evident by the attendance at a session on the topic at SIG-CHI-02 (Faiola and Rosenbaum, 2002). In this paper, we do not engage the debate about the proper location for HCI studies and assume that there is a need to incorporate HCI into New Media curricula. We pose two questions that we believe are central to teaching HCI in these programs. First, why should New Media students learn about HCI? To answer this question, we argue for the importance of this domain for students who are learning to design a variety of digital media. Second, what is an effective way to teach students HCI? Here we present a pedagogical approach, problem based learning (PBL) that is particularly apposite when developing HCI curricula. The utility of PBL is illustrated with a sample problem-based scenario that can be used in a New Media class to help students learn about HCI.

2 Why New Media students should learn about HCI

New Media programs prepare students to work in digital environments. They learn how to design a wide variety of digital products, including web and database interfaces and multimedia. It is equally important for them to understand the social and organizational context of design. More specifically, they should know how to evaluate the digital products they design in terms of efficiency, effectiveness, or other relevant criteria. They should have an appreciation for the role

of the user in the design and use of these products and understand the value of user-centered and participatory design. We argue that the best way for New Media faculty to help students learn about the context of design is by taking advantage of HCI research, by incorporating HCI modules into existing courses or by developing stand-alone HCI courses.

HCI research can aid in the design, development, and implementation of information and communication technologies (ICTs) and can improve students' abilities to design interfaces to these technologies (Hewett et al., 1996). This work can have serious consequences because "well-known catastrophes ... have resulted from not paying enough attention to the human-computer interface" (Meyers, Holland, and Cruz, 1996). We are not arguing that the design work that lies ahead of New Media students will typically have such serious implications, but we do believe that their design work can be improved by exposing them to the techniques and findings of HCI.

Four main themes should be a part of HCI classes in New Media programs. Students should:

- Understand that HCI is a rigorous, methodologically sound, and theoretically grounded procedure for evaluating and improving the design, and use of ICTs;
- Understand that HCI research has practical applications in the systems development lifecycle that have significant impacts on the organization's bottom line
- Be familiar with the best practices as revealed by the current research findings
- Be able to apply their knowledge of HCI to a wide variety of situations in their work

What then is an effective way to teach HCI to New Media students?

3 Using problem based learning to teach HCI

In this section we describe problem-based learning (PBL), a user-centered approach that places students at the center of the process of inquiry. When coupled with scenario-based instruction, PBL provides an effective pedagogical strategy for learning about HCI.

3.1 Problem-based learning and scenario-based instruction

Problem-based learning is a pedagogical strategy that assumes that learning occurs as students work through complex problems drawn from and approximating situations typical of professional practice (Abdullah, 1998; Savery and Duffy; 1995). In general, PBL is a good fit for New Media programs since many of the career paths that students will follow are problem-centered. The focus on realistic problems is an important feature of PBL because it helps "students to take ownership of the learning experience" (Bentley, Sandy, and Lowry 2002: 107). PBL's origins in medical education (Barrows, 1998) and its presence in other disciplines are beyond the scope of this paper and are discussed elsewhere (Rosenbaum, 2000).

In a typical implementation, students are presented with a complex and ill-structured problem. Working in small groups, they decompose the problem into its constituent parts and begin an investigation "from which subject matter and instruction emerge" (Eden, 2000; 56). They collaboratively suggest informal hypotheses or research questions, propose and test solutions, and evaluate their results (Moiao, 2000). As they resolve each component part, they incorporate what they have learned from their reading and experimentation, developing pragmatic, group-based problem solving skills. Throughout the semester, the faculty member meets regularly with the teams to review their progress and assist them with problems that arise in their work.

PBL changes the role of faculty in the learning process. Rather than being at the center of the learning experience, the faculty member takes on the role of the guide and facilitator with the goal of helping students work towards the resolution of the problem. Teaching becomes a process of

providing suggestions as students discuss their progress, directing them towards fruitful lines of inquiry and not a matter of dominating interactions with students (Shanley and Kelly, 1994).

To formulate the problem that serves as a focus of PBL, we suggest using scenario-based instruction (Rossen and Carroll, 2002). This pedagogical strategy is useful because it can "deepen the idea that HCI is concerned with understanding, designing, evaluating and implementing interactive computer systems to match the needs of people" (Vat, 2001; 9). Similar to a case analysis, a scenario is a narrative of a problematic situation adapted from professional practice (Rossen and Carroll, 2002). It can focus on three different components:

- The problem: students define the problem, determine its boundaries, and identify and consider the interests of the stakeholders involved in the design and development of a digital product;
- The interactions: they develop profiles of the people who will use the digital product;
- The activities: they decide how to resolve the problem, determine the appropriate technologies, divide the labor, and begin working on the design solution

How then can PBL and scenario-based instruction be used as the basis upon which New Media students can learn about HCI?

3.2 Using PBL to teach HCI

At the beginning of the semester, students are presented with a scenario. Their initial task is to analyze the scenario, an activity that can be carried out with the entire class or in small groups of four or five. The faculty role in this stage is to assist in the definition of the problem embedded in the scenario and the decomposition of the problem into smaller and manageable components. As students work through this stage, the instructor helps them evaluate the potential resolutions they suggest based on what they already know. With the faculty member's assistance, students then describe what they need to know, clarify key learning issues, and develop an action plan.

During the information gathering stage, which may take several weeks, students explore relevant literatures to determine what they need to do to resolve the various components of the problem. This involves focusing on the problem, activities, and interactions, as described above. Depending on the nature of the scenario, students may complete their information gathering in one period of time. However, each component of the problem may require its own round of research.

During this stage, students assume greater control of their educational experience and learning activities, although the teams continue to meet regularly with the instructor. At these meetings, teams report their progress, discuss problems they are facing and what they will do to resolve them, and describe what they will do next. The instructor listens and comments on the quality of their proposed resolutions and intervenes when necessary, preventing teams from exploring blind alleys. Regular meetings also allow the instructor to pay attention to team dynamics.

During the next stage, students engage in a process of synthesis. This involves a form of critical thinking where students abstract what they have learned from their reading and apply the relevant insights and findings to the problem and its components. The end product of this stage is a design strategy. The instructor works closely with the teams to ensure that their strategies are reasonable and can be completed with the time remaining in the term

Typically, teams present their work in class at the end of the semester. In addition to the instructor's evaluation of their work, students review their experiences by evaluating their performances and the work done by their team members. This allows them to explain what they have learned during the semester and gives the instructor an indication of the extent to which individual students have made progress and of each member's contribution to the team.

3.2.1 A PBL-based scenario: Educational product design

A well-established company that designs digital, interactive products such as computer games and virtual comic books has hired you as a media designer. The company has recently decided to expand their product line to include educational tools. Because of your New Media degree, your boss has made you the lead designer for the first new educational product, as yet unnamed. The product is geared toward 7-10 yr. old girls and is planned to be an interactive tool that teaches decision-making skills through storytelling.

You meet with your boss to decide how to proceed. The head graphic designer and marketing manager are also in attendance. Numerous ideas are tossed around concerning the end product content, "look and feel", and design medium. However, you feel that something is missing. Because of your HCI experience, you know that designing with the user in mind should also be a top priority. You mention this and the group half-heartedly agrees. Your boss is willing to give this a try, but other than focus groups, she is unsure of the process to take to ensure user-centered design (UCD) and wary of the costs associated with extra steps to product deployment.

After the meeting, you begin to think about how to explain the importance of UCD to your project colleagues. You must come up with a framework for the project that incorporates UCD and present it to your boss, colleagues, the marketing head and lead graphic designer. To make the plan airtight, you decide to also mock up a prototype of an end product and include it in your presentation. There is a time constraint; your boss expects a presentation in three weeks.

Your assignment is to assemble and present a solid design argument for a digital, interactive educational product that will be created with UCD. The design argument should include background information and rationale, user observations, content samples, use scenarios, design or system concepts, and interface prototypes. Be prepared to demonstrate the interface that you have developed for your working prototype.

4 Conclusions

We have argued in this brief paper that it is important for New Media students to have an understanding of the research findings and techniques of human-computer interaction because this knowledge will improve their design and building skills. We presented a combination of problem-based learning and scenario-based instruction as an effective pedagogical strategy for teaching New Media students about HCI. This was followed by a brief scenario and suggestions for how it could be used in a problem-based design class as the basis for a semester long team project.

The next steps are to implement this approach in a New Media curriculum and conduct evaluation research to assess the learning outcomes because research "has been mixed about the effectiveness of PBL, although most of this work has focused on its use in medical education" (Rosenbaum, 2000). Vernon and Blake (1993) find that it is a markedly superior approach to traditional learning while Fenwick and Parsons (1998) are critical of the approach. Having the opportunity to conduct comparative research comparing a class using the approach described above with a class using traditional approach would be useful in attempting to settle this debate. We are also working on a version of this approach that will be appropriate for use in doctoral curricula and hope to report on our work in the near future.

References

Abdullah, M.H. (1998). Problem-Based Learning in Language Instruction: A Constructivist Model. *Eric Digest*. ERIC Clearinghouse, Bloomington, IN.

- Barrows, H.S. (1998). The Essentials of Problem-Based Learning. *Journal of Dental Education*, 62(9), 630-633.
- Bentley, J., Sandy, G., & Lowry, G. (2002). Problem-based learning in information systems analysis and design. In Cohen, E. (ed). *Challenges of Information Technology Education in the 21st Century*. Hershey, PA: Idea Group Publishing. p. 100-124.
- Edens, K.M. (2000). Preparing Problem Solvers for the 21st Century through Problem-Based Learning. *College Teaching*, Spring, 48(2), pp.55-61
- Faiola, A. & Rosenbaum, H. (2002). Challenges in teaching usability theory and testing for new media curricula. ACM SIG-CHI. Annual conference. April 23. Minneapolis. Minn.
- Fenwick, T. & Parsons, J. (1998). Boldly solving the world: A critical analysis of problem-based learning as a method of Professional Education. *Studies in the Education of Adults*, 3(1): 53-65.
- Hewett, Baecker, Card, Carey, Gasen, Mantei, Perlman, Strong & Verplank. (1996). ACM SIGCHI Curricula for Human-Computer Interaction. ACM Special Interest Group on Computer-Human Interaction Curriculum Development Group <http://sigchi.org/cdg/>
- Meyers, B., Holland, J., & Cruz, I. (1996). Strategic Directions in Human Computer Interaction. *ACM Computing Surveys* 28(4). <http://www-2.cs.cmu.edu/~bam/nsfworkshop/hcireport.html>
- Moiao, Y. (2000). Supporting Self-directed Learning Processes in a Virtual Collaborative Problem Based Learning Environment. In Chung, M.H. (Ed.). *Proceedings of the 6th America's Conference on Information Systems*. Association for Information Systems. 1784-1790
- Rosenbaum, H. (2000). Teaching Electronic Commerce: Problem-based Learning in a Virtual Economy. *Journal of Informatics Education and Research*. 2(2). 45-58.
- Rossen, M.B. & Carroll, J.M. (2002). *Usability Engineering: Scenario-Based Development of Human-Computer Interaction*. Morgan Kaufmann.
- Savery, J.R. & Duffy, T.M. (1995). Problem based learning: An instructional model and its constructivist framework. *Educational Technology*. 35(5) 35-38.
- Shanley, D.B. & Kelly, M. (1994). Why Problem-Based Learning?
<http://www.odont.lu.se/projects/ADEE/shanley.html>
- Vat, K.H. (2001). Teaching HCI with scenario-based design: the constructivist's synthesis. Proceedings of the 6th annual conference on Innovation and Technology in Computer Science Education. Canterbury, UK.
- Vernon, D.T.A. & Blake, R.L. (1993). Does Problem-Based Learning Work - A Meta-Analysis of Evaluative Research. *Academic Medicine*, 68(7): 550-563.