HCI for PUI: Human-Computer Interaction for Primarily-Undergraduate Institutions

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Abstract
While most research in Human Computer Interaction is conducted at research-focused universities, a majority of universities and colleges in the United States are teaching-focused, without graduate programs. As a result, when developing platforms to broadly share and encourage an HCI curriculum, we must consider the needs of these institutions, even as they may not be visible at our premier venues (such as CHI). *Primarily Undergraduate Institutions* (PUIs) present unique challenges for implementing a curriculum in Human-Computer Interaction, but also afford distinct opportunities. Given the prevalence of such institutions, the challenges and opportunities related to HCI education in these contexts should be reflected in the platforms we use to share and communicate an HCI curriculum.

Author Background
The authors represent a contingent of schools, colleges, and universities that are common across the United States, but are generally underrepresented at academic venues such as CHI. In comparison to research universities, *Primarily Undergraduate Institutions (PUI)* are college settings in which resources of the university are almost exclusively focused on undergraduate students. Faculty retention policies typically weight heavily towards classroom teaching and engagement, and the educational experience often emphasizes small classes that enable one-on-one mentorship

with faculty. PUIs typically have no Ph.D. programs and limited (or no) Masters programs. In addition, many of these schools are small in size (most with < 3000 students), and as a result, operate with small departments.

- **Evan Peck** is an Assistant Professor of Computer Science at Bucknell University - a liberal arts university in central Pennsylvania (USA). He has developed a flipped-classroom model for his undergraduate *Human-Computer Interaction course* at Bucknell[1] and runs an 'Open HCI Lab' to augment student exposure to HCI. In 2017, he created a mailing list of HCI educators at similar institutions (*HCI in PUI*) and has tried to act as an advocate for liberal arts institutions in the HCI community.[2]
- **Michael Stewart** is an Assistant Professor of Computer Science at James Madison University - a large (over 20,000 undergraduate students, and less than 2,000 graduate students) liberal arts university in the Shenandoah Valley of Virginia (USA). He is developing a cross-curricular HCI experience for JMU students by integrating HCI topics into several core and elective courses in the CS major.
- **Madeline E. Smith** is an Assistant Professor of Computer Science at Colgate University - a liberal arts university in Central New York (USA). She currently teaches a senior-level HCI course for Computer Science students and is developing a new course for the Liberal Arts Core that will introduce some HCI topics to students from other departments. Madeline is also working with her department to find the place for HCI topics as they revise the major curriculum.

[1] Bucknell HCI course: http://eg.bucknell.edu/~emp017/hci/
[2] Interview on *Changing Academic Life:* https://goo.gl/yHw16B

Interest in the HCI Living Curriculum

We believe that it is important for any global HCI curriculum to consider the sets of challenges that may be underrepresented at an (expensive) international conference such as *CHI*. We believe we can provide insight into some of these challenges given our experience introducing Human-Computer Interaction to small Computer Science departments in rural environments. Below, we articulate some of these considerations:

- **Limited Expertise:** Because of their small size, it is typical for most PUIs to have only one (or fewer) faculty members with a background in Human-Computer Interaction. This necessarily imposes constraints for developing a robust curriculum. As a result, it's worth considering how the design of a curriculum can empower professors trained outside of design-based disciplines to still effectively teach the foundations of Human-Computer Interaction. For example, Peck has integrated a flipped classroom model into his course that shifts the bulk of information-transfer *outside* the classroom, and transforms class time into a design work. His HCI course has also developed assessment rubrics to reinforce the value of both product *and* process in design.[3]

  Design Implications: We recommend that the HCI curriculum platform organizes curated readings/video content for students by content-topic. This will have the secondary benefit of providing research-driven content to instructors looking to present HCI modules of content to students without the luxury of a dedicated course (for example, VR).

[3] Design document assessment: https://goo.gl/fRpFVv

We also recommend that HCI assignments and/or courses are necessarily paired with assessment information. Assessing design-based outcomes is challenging for professors that may traditionally teach courses with more objective outcomes. Providing clear, scalable assessment guidance (such as rubrics) will increase the likelihood of adoption - particularly for faculty without a strong background in HCI.

- **Limited Exposure outside the Classroom:** While PUIs are situated in diverse environments, those that are situated in more rural contexts see the aforementioned problems amplified. In addition to relying on a single faculty member with HCI expertise, the technical culture that thrives in cities such as San Francisco or Boston is largely inaccessible. An absence of graduate students further limits the exposure to HCI's diversity. As a result, it is important for any HCI curriculum to be explicit in the manner in which in integrates the breadth of the field. For example, in Peck and Smith's HCI courses, they have included conversations with members of HCI's broader community a core component of the course.[4]

  Design Implication: We propose pairing HCI's Living Curriculum website closely with links to external engagement opportunities. This could be as simple as linking to existing SIGCHI mechanisms (summer schools, etc.). More ambitiously, the community could curate a volunteer speaker list of faculty/practitioners who may be willing to virtually speak to other classrooms for 20-30 minutes of time.

- **Limited Room in the Curriculum:** Like many universities across the world, PUIs have also seen significant increases in computer science interest. However, the direct result of such increases on a small faculty body means that many departments cannot afford to staff the same rich set of electives that are present at larger universities. Additionally, liberal arts institutions often require students to take more courses outside of their major departments, leading to a smaller number of courses required for a major. Thus, an HCI curriculum must consider (1) what content should be prioritized under a single course, or (2) how principles of HCI can be woven into *existing CS* curriculum, (3) how training students in HCI can leverage courses from other departments (sociology, psychology, art, etc.).

  Design Implication: Course content that may be shared on HCI's Living Curriculum website should be tagged with meta-data that provides context. Examples: *What size class was this curriculum designed for? What is the class composition (graduate students, undergraduates, online, face-to-face, mixed)? Is this part of a sequence of a broader HCI curriculum or a standalone elective?*. Building this kind of information infrastructure (along with appropriate filters) will allow instructors to select material that best fits the constraints of their own environments.

  We also propose that a portion of this website to focus on *small, modular HCI activities* that can be run independent of a dedicated course. These activities should be tagged with expectations of student backgrounds (*expected background in programming, design, etc.*), allowing them to be ported into existing CS core curriculum.

Opportunities and Contributions

Despite these constraints, we believe that designing with with PUIs in mind has the opportunity to significantly strengthen

[4] HCI class guest speakers https://goo.gl/LeuD4g

the HCI pipeline. Liberal arts colleges[5], for example, have environments where HCI is likely to thrive. Students who major in technical fields in these colleges often have more rigorous breadth requirements that naturally complement HCI (the humanities, social sciences, and arts), and many students are drawn to these universities precisely for their interdisciplinary approach to education.

In addition, the close faculty-student relations (enforced by small classrooms and departments) have traditionally resulted in a disproportionate number of students from liberal arts colleges that move onto prestigious graduate programs. We believe that an HCI curriculum that is carefully woven into the existing structures of PUIs has the opportunity to yield benefits for the greater HCI community.

At many PUIs, professors' tenure cases rely most heavily on pedagogical rather than research contributions. Thus, professors at PUIs with an interest in participating in the development of an HCI curriculum will be more likely to succeed in aligning their institutional values with the success of the project. This shift in focus also opens the door for other opportunities. For example, Peck broadly advertises an *Open HCI Research Group* at Bucknell University, with the explicit goal to broaden participation in Human-Computer Interaction to students who do have curricular involvement through courses.

Going Forward: Together, we represent a growing number of HCI faculty in primarily undergraduate institutions. A mailing list created by Peck in Spring 2017 (*HCI in PUI*) consists of over 25 faculty at PUIs that are active in the SIGCHI community. However, our broader goals are to contribute to the development of HCI not only at our home institutions, but in PUIs that may lack the specific expertise in HCI. To do that, we hope that any platforms that promote an HCI curriculum will necessarily consider the following questions:

- How can HCI be integrated into existing Computer Science curriculum?
- How can HCI be taught effectively without significant training or expertise in the discipline?
- How can an HCI curriculum be developed such that it maximizes contact with other disciplines that may already exist at a university?
- If student exposure is limited to 1-2 courses that are specifically within the HCI umbrella, what content should be prioritized?

[5] *US News* ranks 233 liberal arts colleges and universities