The 2011-2014 SIGCHI Project on HCI Education: Final Report

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Introduction

Human Computer Interaction (HCI) is changing. This reflects the rapid advances we have witnessed in technologies, applications and infrastructures during the last 4 decades since HCI was formally recognized as a field.[1] Some examples of these technological developments include the emergence of personal mobile devices, agent based technologies, and pervasive and ubiquitous computing. New technologies, and the opportunities they afford, have changed and expanded HCI's scope–moving from the office to all environments and moving from a focus on understanding lone users to collocated and distributed social groups are just two examples of that expanded scope. These changes resonate through out the field, but are felt particularly strongly in HCI education, as students, academics, and practitioners struggle to understand and communicate an evolving landscape.

There have been several efforts to outline what would be core courses for a program in HCI. In1988, the then SIGCHI Executive Committee (EC) sponsored research that led to a document published in 1992, entitled *ACM Curricula for Human-Computer Interaction*[2]. Known affectionately at the "Lime Green Report", this document provided a blueprint for early HCI courses. While this curriculum still contains material that is key to our field, we questioned whether there were topics that were not covered, areas that may no longer be considered core, and new areas to address. It was with this spirit of enquiry that present SIGCHI Executive Committee launched the SIGCHI Education project to examine the key topics, trends, and challenges that drive contemporary HCI Education.

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[1] For an overview of HCI from 1945 to 2010, please see: Grudin, J. (2012). A moving target: The evolution of human-computer interaction. In J. Jacko (Ed.), *Human-Computer Interaction Handbook (3rd Edition).* Boca Raton, FL: Taylor & Francis, Ltd.

[2] This curriculum can be found online (http://old.sigchi.org/cdg/index.html).

The SIGCHI Project on HCI Education was chartered as a collaboration between researchers acting in three key roles: Elizabeth Churchill, an industry-based researcher and practitioner; Jenny Preece, a leading academic educator and researcher; and Anne Bowser, a student who began her PhD course work the same year that this project was initiated.

Our project identified five main goals:

(1) Identifying what topics, if any, remain core and foundational to the theory and practice of HCI despite ongoing changes in technology design and development.
(2) Solidifying our understanding of which HCI skills, knowledge and methods are taught in courses at universities around the world and in practitioner/training courses, and how these courses are structured.
(3) Expanding our understanding of how different people experience HCI education, especially by elucidating the differences between three key perspectives: students, academics, and practitioners across the globe.
(4) Understanding how HCI educators, practitioners and students believe professional organizations like SIGCHI can support HCI education by providing key tools and resources.
(5) Identifying key educational resources to support global HCI Education, through investigating mechanisms for a permanent, community-led repository, and by seeding a repository.

Goal	2011	2012	2013	2014
Identifying key topics	Pilot survey; interviews; main survey	Main survey (survey completions = 339)	Main survey (cumulative survey completions = 500)	Main survey (cumulative survey completions = 616 at close)
Validating our understanding of educational practices	Pilot resource review	Detailed scan of common courses and syllabi; CHI Roundtable	CHI Roundtable; idea of "living curriculum"	CHI Workshop
Understanding global HCI education	Lesser focus	Chinese (n= 52) and Brazilian (n=156) samples	Chilean (n= 48) sample; outreach	Maps to visualize the CHI community
Understanding population differences	Compare 3 perspectives via interviews	Compare 3 perspectives via surveys	Lesser focus	Interviews with hiring managers
Gathering supporting resources	Website and social media presence	Annotated bibliography	List of syllabi	Key internships; Workshop papers

Table 1: Key Activities in the SIGCHI Project on HCI Education, by Year.

Table 1 summarizes how each of these goals was achieved at different stages of our work. This report summarizes the key achievements for each of the four years of our project. We conclude with steps for moving forward, to be undertaken by the researchers responsible for this undertaking, and also by the incoming SIGCHI Executive Committee.

Highlights from 2011

Our 2011 research was designed to "take the pulse" of a changing field. We began by distributing a pilot survey to 117 students (n= 69), academics (n= 69), and practitioners (n= 26). This survey included open-ended questions, including: *What do you consider the most important skills for students in HCI and related fields to gain at the undergraduate, masters, and graduate levels? What do you consider important challenges in HCI, and in HCI Education?*

Following this pilot survey we recruited 54 participants to address these questions in greater depth through interviews. We began analyzing our pilot research through a qualitative methodology involving iterative coding of open-ended survey questions and interview transcripts. We validated our empirical research by scanning libraries, reviewing different HCI programs, and collecting syllabi from different instructors.

During this time we also established a presence on the SIGCHI website and began to gather enthusiasm through social media outreach.

Analyzing our pilot survey with 117 participants and the pilot interviews allowed us to identify the most important components and considerations of HCI education in the language of our community. This allowed us to construct a large survey covering the following areas of interest:

- Competencies in Computer Science, Psychology, and Design.
- Related fields of study.
- Topics in HCI.
- Interfaces, Displays and Devices.
- Input Modalities and Data Collection.
- Design Paradigms and Perspectives.
- Tools and Methods in the Design Process.
- Empirical Research Methods.
- Different Ways of Learning (coursework, research, internships, etc.).
- Challenges to HCI Education and the Profession.
- Important Conferences in HCI.
- Key Journals in HCI.

Highlights from 2012

We began soliciting survey participants in November of 2011. These were recruited as a snowball sample, primarily by inviting friends and colleagues of our pilot survey and interview participants. In March and April of 2012, a second push aimed at gathering more international participation. We used email distribution lists and asked the HCI community on Twitter to re-tweet our survey link and share the link with different Facebook groups around the world.

We held our first roundtable lunch at CHI 2012. This was designed to present our emerging findings to the community at large, solicit feedback, and identify areas for future research.

Following CHI, we reviewed 52 HCI courses, developing a classification scheme for the types of content included/ course taught (e.g., courses that teach methods, courses that teach foundational theory, courses that teach programming...). Reviewing key courses enhanced our understanding of contemporary HCI, and also allowed us to compile a short annotated bibliography of the most common textbooks, articles, etc. utilized in HCI Education.

This bibliography, summarized in table 2, is available at http://www.sigchi.org/resources/education/2011-education-project-1/key-books-articles-and-conference-proceedings. Note that this resource is designed as a list of the frequently cited texts used in HCI education based on our course review; the SIGCHI HCI Education website also links to more comprehensive repositories, namely the HCI Bibliography hosted by SIGCHI. (http://www.hcibib.org/) and the ACM Digital Library.

Resource Type	Number	Example
Stand alone textbooks	5	Shneiderman, B., Plaisant, C., Cohen, M. & Jacobs, S. (2009). *Designing the User Interface: Strategies for Effective Human-Computer Interaction* (5th Edition). Boston, MA: Addison-Wesley.
Other books	9	Beyer, H. & Holtzblatt, K. (1998). *Contextual Design: Defining Customer-Centered Systems*. San Diago, CA: Academic Press.
Book Chapters, articles, conference proceedings	16	Bush, V. (1945). As we may think. *The Atlantic Monthly, 176,* 37-47.

Table 2: Summary of our Brief Annotated Bibliography of common materials in HCI, from a review of 52 courses.

Our initial survey yielded a sample of 339 participants from six continents and 36 countries. While this sample was diverse in terms of representation from our three key audiences of students, academics, and practitioners, we decided to explicitly sample from new populations where HCI is emerging, or that may be under-represented at CHI to broaden our geographic scope. In the second half of 2012, we collaborated with two volunteers, Simone Barbosa from Brazil and Zhengjie Liu from China. Simone translated our survey into Portuguese, and recruited a sample of 156 participants. Zhengjie translated our survey into Mandarin, and recruited a sample of 52 participants.

We analyzed our survey responses first for overall trends, noting the survey items ranked as "very important" or "important" by the largest number of participants. During this time the importance of methods in HCI education became clear; of our top 10 rated survey responses, seven were methods such as "general qualitative research" and "prototyping (general)." We also examined differences between the general sample, and our samples from Brazil and China, through Chi-squared tests.[3] A full report of this analysis can be found at http://www.sigchi.org/resources/education/2011-education-project-1/report-of-2012-activities/view.

Based on this research we were invited to advice ACM on how to integrate HCI into the new Computer Science curriculum.

Highlights from 2013
In the spring of 2013, our research was published as the cover article and feature in the March-April issue of *Interactions Magazine* (http://interactions.acm.org/archive/view/march-april-2013/teaching-and-learning-human-computer-interaction). Publishing in Interactions generated interest in our project and drew traffic to our online survey.

A significant focus of our 2013 work was community building. This began with a second roundtable lunch at CHI 2013. During this lunch we hosted a mix of attendees from the 2012 workshop, and new participants. This enabled us to begin mobilizing a true community of stakeholders with real interest in our work, and the willingness to donate their time to collect resources on an ongoing basis.

As part of this community building we contacted the heads of local chapters as well as the entirety our participants to date, recruiting regional volunteers to act as liaisons for collecting resources to support HCI education. By working with three additional volunteers (Claudia Lopez, Robert Munoz, and Thiago Barcelos) we translated our survey into Spanish, and secured an additional sample of 48

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[3] For a detailed description of our methods, please see: Churchill, E., Bowser, A. & Preece, J. (2013). Teaching and learning human-computer iteraction. *Interactions, XX,* 2, 44-53.

participants to support our cross-cultural analysis. We also translated our survey into French with help from Catherine Plaisant.

These efforts led to the collection of two key resources: course syllabi, and details of summer internships. We published a sample of 49 syllabi on the SIGCHI website at the end of 2013. This collection included general introductory courses, advanced or capstone courses, technology development courses, and topical courses (e.g. electives), as summarized in table 3. We reviewed undergraduate, Masters, and PhD courses—noting that courses were often cross listed, so that undergraduate and Masters students, or masters and PhD students, would take a single course together (sometimes, but not always, with different requirements).

Type of Course	Number	Example
General introductory or survey courses	9	Introduction to Human-Centered Computing, Amy Bruckman, Georgia Tech, Fall 2013
General advanced or capstone courses	6	Research Topics in Human-Computer Interaction, Michael Bernstein, Stanford University, Spring 2013
Technology development or programming	6	Interactive Education Technologies, Audrey Girouard, Carleton University, Winter 2014.
Topical electives	28	Critical Making, Eric Paulos, UC-Berkeley, Spring 2014

Table 3: Collection of Syllabi from undergraduate and graduate course in HCI.

Through community engagement we came to understand the need for a "living curriculum," or a living repository of HCI education ideas and resources—including pedagogical tools such as lesson plans, assignments, and bibliographies—collected and curated by the community at large. Our vision of a living curriculum is reflected in our workshop abstract time, available at http://www.sigchi.org/resources/education/chi-2014-education-workshop-abstract.

Highlights from 2015
Summer internships fuse connections between academia and industry, and enable HCI students to gain valuable real-world experience. Respondents to our 2011 pilot and main surveys asked for a list of internships as a SIGCHI resource. In early 2014 we published a list of internships offered by 17 key companies in HCI. For each company we list basic information about the internships offered including location, the level of education required, and supplementary information

including a URL. This resource, available at
http://www.sigchi.org/resources/education/2011-education-project-1/internships,
is not designed as a job board; rather, it offers key examples of the opportunities
available in the US and abroad.g

In April we hosted a CHI Workshop, "Designing a Living Curriculum to Support
Global HCI Education," to understand how our community envisions the living
curriculum unfolding. Eight submission papers articulating the vision of other
students, academics, and industry practitioners are available at
http://www.sigchi.org/resources/education/chi-2014-education-workshop-position-
papers-1.

During this workshop we identified the key parameters of a living curriculum as:
- A community generated, and community-curated (e.g., crowdsourced), set
  of resources.
- Consisting of at least five core themes:
  - Aesthetics, i.e., art, design, creativity;
  - Ethics;
  - Diverse theoretical perspectives and knowledge traditions;
  - Technology, both current and anticipated; and,
  - Critical reflection.
- A modular, adaptive collection of with different points of entry based on
  prior knowledge and expertise (i.e., social scientists and computer
  scientists may access materials through separate channels).

We also discussed how SIGCHI can help sustain a crowdsourced living
curriculum by offering incentives for contributions and leading partnerships with
organizations such as IxDA and the IA Institute. Finally, we identified key
technical specifications for a living curriculum, such as the necessity of allowing
multiple users to not only download data, but also contribute and curate
resources.

At the opening presentation given by CHI conference chairs we shared a map of
all conference contributions, included in the opening presentation given by
conference chairs. This map and the underlying data set are hosted at
http://www.sigchi.org/resources/education/2011-education-project-1/maps-of-chi-
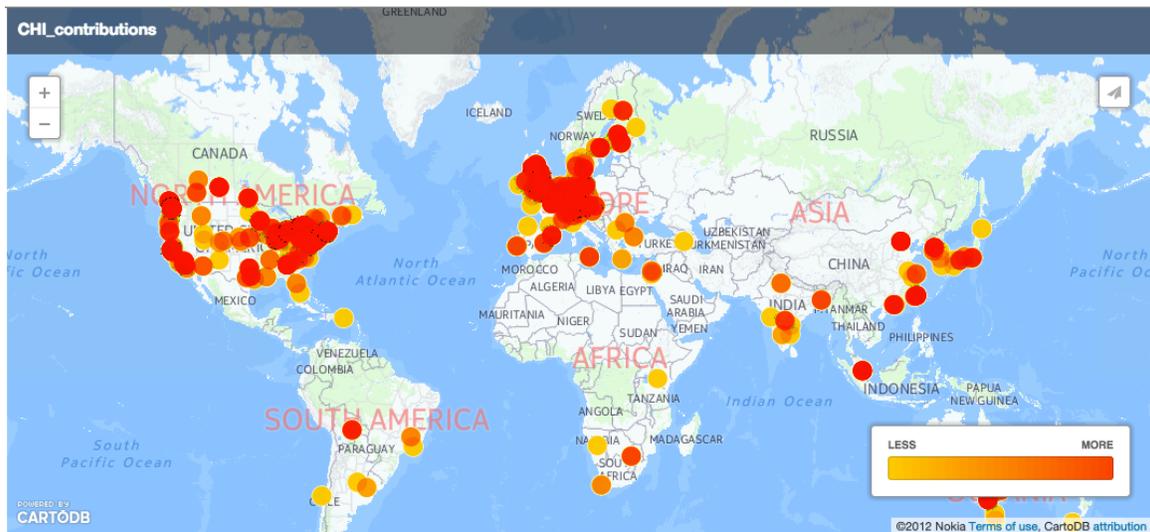2014.

Figure 1: A map contributions (including papers, workshops, and notes) accepted to CHI 2014. Note that Europe and North American dominate this visualization.

Finally, we interviewed 5 hiring managers from large companies with a strong presence at CHI to round out our perspectives of the different roles in HCI. We returned to our survey during the second half of 2014, bringing the total sample up to 616 participants. This effort allowed us to substantiate the findings of our 2012 analysis, and to examine temporal differences in responses between our 2014 sample and the early recruitment efforts from 2011. Analysis and interpretation of key temporal differences is ongoing and will be published during 2015, as discussed below.

The way forward: Next steps
For the researchers leading the SIGCHI Project on HCI Education
An article on emerging findings was published in *Interactions* magazine at the midpoint of this research. We owe our community a follow-up article to ensure that our later findings can benefit the students, academics, and practitioners engaged in HCI Education and can be put into practice by the new SIGCHI Executive Committee.

Specifically, our aim will be to:
- Briefly remind readers of the key issues in HCI Education.
- Report the findings of the 2014 data collection and discuss similarities and differences with 2011 data.
- Propose strategies for the HCI community to develop a "Living HCI Education Curriculum" using crowdsourcing and other community-oriented approaches.

What happens next depends on the resources and effort that SIGCHI wishes to devote to creating a *"Living HCI Education Curriculum"* and responses from the SIGCHI community. We will complete the second article to inform the HCI community of our findings. We further recommend that the current SIGCHI EC should discuss the notion of a Living Curriculum and encourage the next SIGCHI EC to work with the SIGCHI community to implement it.

For the incoming SIGCHI Executive Committee (EC)
Implementing a *Living HCI Education Curriculum* will require the following three components:
- Leadership from the SIGCHI EC.
- Resources to develop a platform/app and to provide at least a minimal amount of technical and community management.
- A body of enthusiastic HCI educators and students who wish to form a community to support development and management of a *Living Curriculum.*

The incoming SIGCHI EC will be responsible for determining how and whether the first two points are achieved. We are happy to offer our list of contacts towards supporting the third of these key components, and wish the SIGCHI EC success in its future endeavors.