Report of 2012 SIGCHI Education Activities

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Executive Summary

Just as Tom Hewett and colleagues reported in 1992, the field of HCI is continually changing and not surprisingly this impacts HCI education. Based on our analysis of 547 survey responses, 54 follow up interviews, 52 courses and 22 programs we offer the following high-level summary of key findings from this study:

- HCI is becoming increasingly multidisciplinary, with educators questioning the role and value of fields like anthropology and sociology in addition to computer science, psychology, design and engineering
- Students, professors and practitioners differ in what they consider to be the most important and the least important topics for HCI education
- The multidisciplinarity of HCI coupled with these different perspectives is disconcerting for some people, particularly students who sense a divide between what is most valued by academia and what is most valued by practitioners.
- There appear to be some differences between countries about what the most important and least important topics are in HCI Education, as indicated by survey data from primarily the US and Europe, and data from China, and Brazil. Results are preliminary and more work is needed on this topic.
- Teaching students about design, including the variety of quantitative and qualitative methods necessary to do HCI design and evaluate HCI design, remains a central priority, with some evidence to indicate that qualitative methods are gaining a stronger presence.
- While a few people call for a unified, singular curriculum reflecting an agreed upon canon of HCI research, methods and practices, most believ that flexibility in curriculum design is essential, even if a general ‘HCI sensibility’ can be agreed upon.

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> *Human-computer interaction 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.*
>
> Hewett et al, 1992

Introduction

The field of Human Computer Interaction (HCI) is changing. This reflects the rapid advances we have seen in technologies and especially in communications technology, applications and infrastructures during the last 4 decades since HCI was formally recognized as a field. Some examples of these technological developments include the emergence of personal mobile devices, agent based technologies, pervasive and ubiquitous computing; these all signal a greater need to understand how interactive technologies do or do not transform our lives. Much, if not most, of this transformation if for the better but as HCI specialists we also need to be wary about potential adverse affects of technology being unusable, unreliable or overbearing. We need to ensure that the technologies that we develop do indeed serve people, and what better way is there to do that than through appropriate, engaging education of the next generation of technology leaders, teachers and researchers? Furthermore, ensuring that this education is available when needed throughout professionals' lives is essential so that they can stay abreast of changes in technology and the emergence of state-of-the-art methodologies, theories and practices to deal with those changes.

A curriculum for HCI?

There have been several efforts to outline what would be core courses for a program in HCI. In1988 the then Executive Committee of SigCHI sponsored research that led, in collaboration with several key thinkers on related panels, to a document published in 1992 entitled *ACM Curricula for Human-Computer Interaction*[1]. Known affectionately at the "Lime Green Report", this document provided a blue-print for early HCI courses and the quote at the beginning of this article is from it.

While this 1992 curriculum proposal 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 seen as core and whether there are areas that need to be added. It was with this spirit of enquiry that we launched the SigCHI Education project to look at education in HCI.

SigCHI Executive Committee Project, 2012

Our intention was not specifically to *update* the 1992 curriculum nor to replace it, even though there have been many requests over the years. Rather, our efforts have been intended to engage the HCI community in their thinking about *What is HCI today? What will it be tomorrow? What should be core to HCI as a discipline or field of enquiry*? With this kind of grounding, we can then perhaps consider what topics would/could be included into curricula for HCI and HCI related programs. Therefore rather than taking the 1992 curriculum or any other documents as a starting point, we started with conversations and surveys with people in our community to get a grounding in order to address what are the current perspectives and concerns.

We note also that there are other initiatives by other professional bodies that share some similar concerns, such as those of the IEEE, and the British Human Computer Group of the British Computer Society, to name just two. Some focus on developing core content for courses that will be taken by computer scientists and engineers as well as designers and students in related fields. These parallel efforts are, in our opinion, a sign that many of the methods and tools we associate with HCI and that have been pioneered by HCI professionals are being recognized as key for technology infrastructure, application, device and service design and development.

As we all work on these various topics we hope that in collaboration an outcome of this research will be to stir interest within and beyond our immediate HCI

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

[2] This and the following statistics are taken from survey data. Interview and roundtable participants

communities about the design/redesign and promotion of HCI, and to have more input in the creation of community-based collaboration and sharing of materials and teaching guidelines. Such collaborative efforts will be particularly helpful for HCI educators and learners in areas where HCI is emerging or growing as a field of study and where business growth in interactive technology design and development is growing rapidly. In tandem with the efforts of educators at top universities in the area of online course development, an ongoing goal for this project is to deliver recommendations for a collaborative social platform for sharing ideas about HCI education. We see this as a "living resource", to be shared by all, rather than a static curriculum recommendation. However, there are clearly some foci that are central to HCI and will always remain so.

Our project identified five main goals:

(1) Identifying what topics, if any, remain core and foundational to the theory and practice of HCI despite the ongoing changes that are being wrought in the technology design and development arena
(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 students, academics, and practitioners across the globe
(4) Understanding how HCI educators, practitioners and students, as well as those who request, need and consume our outputs believe professional organizations like SigCHI can support HCI education by providing key tools and resources
(5) Gathering the resources that can best support the global HCI community

To date we have made some progress on items 1-3, but have not addressed items 4 and 5 in any detail.

What we did

So far we have used two research methods. The first, and primary method was a hosted survey which was created using SurveyMonkey. Research for the survey design began in 2011 with a pilot survey completed by 177 participants and continued with 54 follow up interviews. During our pilot research period we also scanned libraries, reviewed different programs, and collected syllabi. After synthesizing and reflecting on common themes, tensions, and surprises, we used our preliminary research results to develop a comprehensive survey that became the focal point of our work during 2012. By grounding our survey in previous research we were able to focus on topics that the HCI community identified as important and probe nuanced themes as they emerged. This reflected our intention to first identify topics that the community considered to be important to

HCI (rather than taking a top down approach from curriculum or text book analysis), and then to engage in a second phase where we asked survey respondents how important those identified items are.

The survey was divided into sections and covered 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
- Important Journals in HCI

The majority of the questions asked participants to indicate how they valued a topic using a 5-point Likert scale, with items ranked as "Very Important," "Important," "Moderately Important," "Moderately unimportant," and "Unimportant".

The survey was initially disseminated between November 3rd and November 23rd in 2011. A second push aimed at gathering more international audience participation was disseminated between March 27th and April 24th in 2012. We distributed the survey using email distribution lists and through social media connections, especially by asking the HCI community on Twitter to re-tweet our survey link and by sharing the survey link with various Facebook groups.

In addition to the survey results we conducted interviews and focus groups to confirm, clarify, and gain new perspectives on results garnered from the survey.

55 Interviews were conducted in-person at the CHI 2011 and 2012 conferences and by phone and Skype. Interviewees were selected using two methods. We invited our respondents to participate in a follow-up interview at the end of our survey. Every participant who provided their name and email address was contacted. To expand our audience, we also walked around at CHI recruiting participants in person. While interviews were semi-structured, all interviewees answered the following questions:

- What do you consider the most important skills for students in HCI and related fields to gain at the undergraduate, masters, and graduate levels?
- If you were in charge of hiring a colleague, what qualifications or skill

sets would you consider most important?
- What do you consider some important trends in HCI, and in HCI Education?
- What do you consider some important challenges in HCI, and in HCI Education?

We requested 30 minutes of our interviewee's time. Actual interview times ranged from 16 minutes to 2.5 hours, with most interviews lasting around 40 minutes. This variation is accounted for by the open-ended interview methodology that we adopted which involved probing for additional information from interviewees until no new topics were offered. In addition to one on one interviews, we hosted a focus group at CHI 2012 with invited guests representing key educators and learners in HCI from a range of countries across the world. The interview transcripts and focus group comments were analyzed and key themes extracted using a grounded theory approach.

Finally, 52 HCI courses were reviewed, and a classification scheme developed for the types of content included/ courses taught (i.e. courses that teach methods, courses that teach foundational theory, courses that teach programming...). Of course many courses were coded for multiple types of content as would be expected. To identify courses for review, we began with a Google search, examining the first 50 relevant results but only accepting syllabi from the last 3 years. If a school was needed to increase diverse representation that did not have a syllabus online, we emailed professors and asked for a syllabus. For international representation we searched specifically for courses at schools with papers in the CHI Conference whose authors reside outside the USA. While we acknowledge that this process has limitations we did the best we could within the limitations of budget and time. For example, both searching and emailing professors from some institutions overseas was less effective than applying the same practice in the USA. It was also more difficult to identify courses that were clearly HCI instead of design or computer science. However, by far the greatest limitation to this methodology is that only English-language materials are included.

While working to balance our sample with overseas institutions we compiled a spreadsheet of the schools with the most CHI papers from 2010-2012. We used this spreadsheet to assess which schools could, arguably, be most actively involved in reinforcing or redirecting new areas of research and teaching in the HCI community. By consulting our list of schools with the most CHI papers and our list of strong HCI programs we ensured that courses form the vast majority of top tier schools were reviewed.

When reviewing these courses, a list of the top textbooks, articles, etc. in HCI Education was compiled, and an annotated bibliography of resources covering

diverse topics, methods, and subjects was developed. An ongoing review of both academic programs and specific courses offered at different institutions helps us confirm our research findings by providing concrete evidence of subjects, topics, and methods covered in different curricula and syllabi.

Which countries have contributed to this project so far?
It became clear early in our research that a key challenge would be to find diverse participants with regard to geographic location, role in HCI as student, academic, or industry practitioner, age, experience in HCI, and education. Our 339 participants represent six continents and 36 countries (see *figure 1* for a table and *figure 2* for a map). The initial survey was in English, but we have more recently translated the survey into Portuguese and Chinese with help from colleagues in Brazil and China.

Continent	*Countries Represented*
North America	*United States, Canada, Mexico*
South America	*Brazil, Colombia*
Europe	*England, Ireland, Scotland, Wales, Spain, Portugal, France, Belgium, Switzerland, Germany, Poland, Austria, Hungary, The Czech Republic, The Netherlands, Norway, Finland, Sweden, Denmark, Italy, Cyprus, Greece,*
Asia	*China, India, Japan, Republic of Korea, Singapore*
Africa	*Namibia, South Africa*
Australia & New Zealand	*Australia, New Zealand*

Figure 1: Countries represented in our general sample of 339 participants, grouped by continent

General Sample Demographics

Recognizing that the same person can play multiple roles in HCI, we allowed our participants to identify as student, academic, and/or industry professional. 54% of our survey participants identified as professors or other academics, 25% identified as students, and 34% identified as industry professionals.[2]

Most participants were in the 31-40 age range. Perhaps unsurprisingly, years' experience in HCI was skewed, with the most participants reporting 6-10 years' experience in HCI. Participants reported a range of educational backgrounds. Sixty-eight per cent (68%) were formally educated in a related field, 47% were

[2] This and the following statistics are taken from survey data. Interview and roundtable participants were not asked as detailed demographic questions.

formally educated in HCI, and 40% gained their HCI education through professional experience (again, participants were invited to select more than one response). We speculate that this may be because students and those early in their careers are those most concerned with the future of the field and may be reflective of how the skills they have been taught are translating into practice.

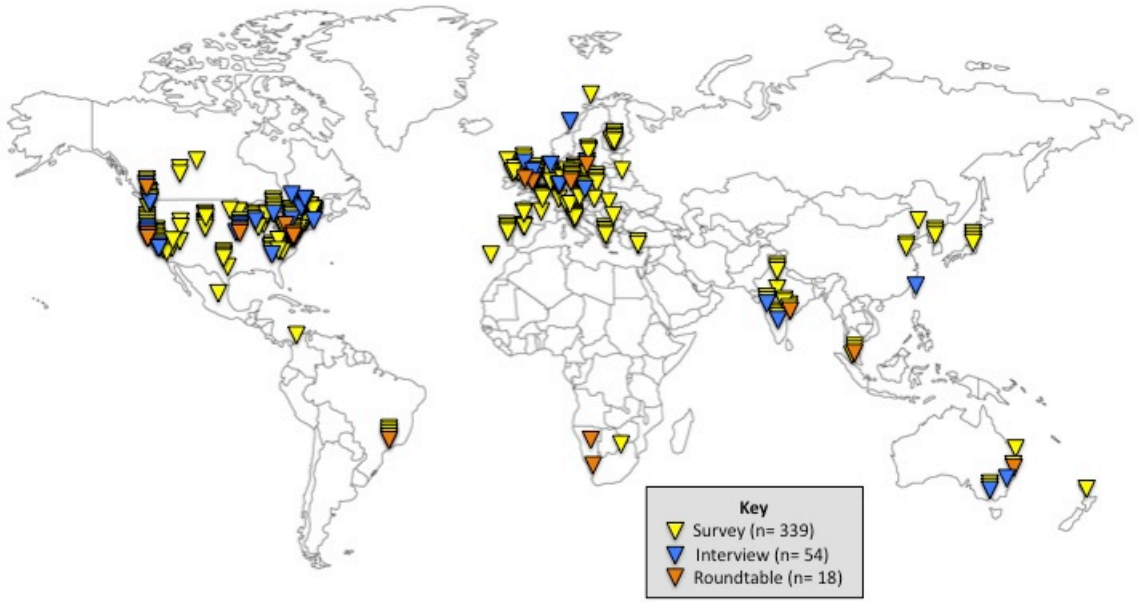

Figure 2 A global response. Survey locations were taken from IP addresses. Locations for interview and roundtable participants were mapped based on the knowledge of researchers.

The Brazilian Sample (156 participants)

The most respondents (47%) were professors or other academic researchers, and a large sample (43%) identified as students. There were not as many Industry professionals in our Brazilian sample as in either our general sample or our Chinese sample (10%). An equal number of participants (37%) fell into the 21-30 age range and the 31-40 age range. 49% of participants reported 0-5 years' experience in HCI, with an additional 28% reporting 6-10 years' experience. The majority of participants (51%) were educated in a related field. Twenty-nine percent (29%) learned HCI by practicing it, and 27% received a formal education in HCI.

The Chinese Sample (52 participants)

Thirty-five percent (35%) of Chinese participants identified as students, 36% identified as industry professionals, and 26% identified as professors or other academics. The remaining participants did not chose to identify a role in HCI.

Both participant age and years of experience in HCI were skewed towards the lower end of the ranges. The largest number of participants fell into the 21-30 age range (63%), with an additional 21% of participants reporting their age as 31-40. Sixty-seven (67%) of our Chinese participants had 0-5 years' experience in HCI, with an additional 21% reporting 6-10 years' experience. Forty-one percent (41%) of Chinese participants were educated in a related field, while 40% were formally educated in HCI. The remaining 15% gained their education through professional experience.

What we have discovered so far?

The results in this section draw from two main areas of research: the answers to select multiple-choice survey questions and our preliminary review of syllabi. We analyze the survey in greater detail and provide information on different HCI programs in a forthcoming final report that will be posted to the SigCHI website

The Top Topics in HCI Education

We began our analysis by calculating which topics were generally valued most by the respondents in our initial, general population survey. This was done first by calculating what percentage of participants ranked an item “very important” or “important,” a method chosen because it was relatively resilient to low-end extreme scores (this was an issue in analyzing items with bimodal distributions, for example topics in computer science and certain qualitative methods). For the most part, we use percentages to report our data in this and earlier reports. We later decided to additionally analyze by average ranking, which takes into account low-end scores but does accurately represent the full diversity of our respondent’s beliefs.

The strongest finding from this research is the importance of methods for HCI education. Of the eleven survey items that were valued the highest using these two methedologies, eight were design or empirical research methodologies (see *figure 3*).

Top Survey Responses		
Survey Item	**Average rank on a 5-point scale (5 = "Very Important"; 1 = "Unimportant")**	**Percent of participants who ranked item as "very important" or "important"**
Mobile	4.71	92%
General qualitative research	4.60	94%
Interaction design	4.57	93%
Observation	4.56	88%
Interviews	4.53	91%
Prototyping (general)	4.53	89%
Internships/ apprenticeships	4.53	78%
Analyzing and applying research	4.52	84%
General empirical research	4.51	90%
Practical/ work experience	4.50	83%
Paper/ low-fidelity prototyping	4.46	89%

Figure 3: Top survey responses. Design and empirical research methodologies are highlighted. As one interview participant suggests, HCI education "needs to go Meta with methods".

The survey item "general qualitative research" was labeled "very important" or "important" by more respondents than any other survey item, and received an average ranking of 4.60 on a 5-point scale. Individual qualitative research methods also received high rankings (91% agreed that interviews are important, an average ranking of 4.53; 88% support observation, an average ranking of 4.56). As one student reports, *"One of the most eye-opening experiences for me was a class on qualitative research methods. Really going out in the world and learning to engage firsthand in ethnographic research, learning how to actually conduct interviews with useful, interesting results, I found that one of the strongest sides of a technical curriculum."*

Despite the obvious importance of qualitative research the question of whether these methods should be situated in "a technical curriculum," or within epistemologies from the social sciences, is open for discussion. A computer science student credits the social sciences - women's studies, specifically - with illuminating *"things about my users as a diverse group of people. Otherwise...an understanding about the role that these systems play would be completely foreign."* However, when asked about subjects specifically, only a minority (34%; an average ranking of 3.14) of respondents believe that "Anthropology" is important to study, compared to a majority who uphold the importance of more traditional subjects such as Design, Computer Science, and Cognitive Science (70%, 4.19; 64%, 3.68, and 60%, 3.64, respectively).

Qualitative research supplements, rather than replaces, quantitative research. Eighty-nine percent (89%) of survey respondents indicated that "general quantitative research" is important; as one professor quips, *"it's hard to come up with anything scientific without having a formula."* Similarly, a designer recognizes that *"You don't need to be a statistician but you need to understand the basics to be able to ask the question and take the data you think is most relevant to integrate it, visualize it and do, as a designer, something that someone else couldn't do."*

Why are methods so much more prominent in this research than in the 1992 curriculum? The emphasis on methods may be a response to the trend toward "natural" interfaces (e.g., gestural, speech) and the way technology is used so widely in our everyday lives from smart phones to tablets to wearables, etc. More survey respondents (89%) believed that mobile interfaces were important than believed desktop interfaces to be so (76%), and almost as many respondents said that tablets were important (75%) as desktops. In an era of rapidly emerging technologies it is more important to help students develop critical skills, the ability to frame problems and a keen sensibility around what methods to use when than to teach classic principles of desktop design.

Just as they illuminate the importance of existing methodologies, new interfaces and technologies may support the creation of new methods. As one student believes, *"The complexity is growing so much in all of these interfaces that we can't design it outright... we need to design a tool to design it, we need to learn to design meta-designers."*

Analyzing results for Different Populations

Our initial survey contained very high populations of respondents from the US, Canada, and Great Britain. As mentioned above, we began our translation efforts in 2012 with a Brazilian Sample and a Chinese sample with the aim of determining which of our findings were applicable to the global HCI population and which of our findings might be specific to certain cultures.

Top Survey Responses by Population						
	General Sample		Brazil		China	
Rank	*Item*	*Rating*	*Item*	*Rating*	*Item*	*Rating*
1	Mobile	**4.71**	Interaction design	**4.86**	Mobile	**4.67**
2	General qualitative research	**4.60**	Interaction design	**4.78**	Interaction design	**4.65**
3	Interaction design	**4.57**	Usability testing	**4.75**	Interaction design	**4.63**
-3	Probabalistic computing	**2.29**	Philosophy of science	**2.24**	A divide between academia and industry	**2.73**
-2	Philosophy	**2.22**	Philosophy	**2.19**	Economics	**2.63**
-1	Economics	**1.99**	Economics	**2.04**	Philosophy	**2.50**

Figure 4: Highest- and lowest-ranked survey items, by population. Rankings were given on a 5-point scale where "5" was designated as "Very Important" and "1" as "Unimportant". Blue designates popular items; red designates unpopular items. Survey items that multiple populations value similarly are displayed in a darker shade. For a table including item category and top ten ranking, please see Appendix A.

There seems to be a strong consensus about the most important and least important survey items. All three groups believe that Interaction Design is crucial to HCI Education. Despite these commonalities, we wondered whether the same consensus would exist for survey items that did not fall at the extreme top or the extreme bottom of rankings.

Chi-square tests were conducted to examine whether there are cultural differences in the valuation of topics in topics in HCI, methods in the design process, and related subjects or fields; the results of these are reported in *figure 5.* It's important to note that our general audience contained a small number of both Brazilian and Chinese participants.

Different Survey Responses by Population			
	Subjects and Related Fields	**Topics in HCI**	**Methods**
Brazil-More positive	Ergonomics, Software Engineering	Disability/ Accessibility, Information Architecture, Information Visualization, Media Criticism, Natural Language Processing, Persuasive Computing, Product Development, Social Network Analysis	Participatory Design, Remote Usability testing, Wireframing, Personas, Waterfall Method, Card Sorting, Discount Usability, Eye Tracking, GOMS, Mental Models, Model-based Evaluation
Brazil-More negative	Business	n/a	Focus Groups
China-More positive	Art, Graphic design, Ergonomics, Psychology (General), Statistics	Data Mining, eCommerce, HCI for Development, Healthcare/ Health Informatics, Machine Learning, Natural Language Processing, Probabilistic Computing, Robotics, Social Network Analysis	GOMS, Model-based evaluation
China-More negative	n/a	Ethics	n/a
Consensus	Cognitive Science, Design, Philosophy	Accessibility, Teamwork, Social Computing, Social Media, Ubicomp	Agile/ Iterative design

Figure 5: Different valuations of our general population, Brazilian Participants, and Chinese Participants

For each trend in the table, statistical significance was found twice; once on the positive end of the scale (i.e., significantly more participants ranked the item "important" or "very important") and once on the negative end of the scale (i.e., significantly more participants ranked the item "moderately unimportant" or "unimportant").

We chose to report only the strongest findings partially because approximately 90% of the questions were analyzed with somewhat significant results. The final row in the table, "consensus," displays the 10% of survey items where no population differed even slightly from another. While more populations are needed to determine whether these items are truly valued universally, validation by multiple cultures does suggest a stronger consensus than other items enjoy.

Recognizing that a participant's role in HCI as student, academic, or practitioner influences how certain survey items are valued, we also analyzed how these

different groups responded to different survey questions. An example of this analysis can be found in *figure 5.*

Valuation of topics in HCI by role in HCI			
	Students	**Professors/Academics**	**Industry Professionals**
Rated more positively than other groups	Natural language processing	Ubiquitous computing	Change management, eCommerce, Information architecture, Product development, Project management
Rated more negatively than other groups		Change management, Media criticism, Social Network Analysis	Healthcare/ health informatics, History of HCI, Ubiquitous computing

Figure 5: Valuation of topics in HCI by role in HCI

Review of Programs, Textbooks, and Syllabi

We are conducting an ongoing review of Bachelor's, Master's, and Doctoral programs in HCI. In the future, we will review selected syllabi of introductory and elective HCI courses offered at top HCI publishing universities in HCI. Key commonalities and differences have begun to emerge in our preliminary analyses of syllabi and courses: For example, all of the HCI courses reviewed cover material from the following areas:

- Foundational theory
- Current topics
- Tools and technologies
- Design research methods
- Empirical research methods
- Design Studio

Many courses require students to complete one of the following projects:

- Design, build and test an application
- Conduct and report on empirical research

By examining the material covered with the assigned projects we were able to identify some course models that were particularly common:

- Introduction to HCI model = Foundational theory + Design research methods + Design, build and test an application
- Graduate methods = design research methods and/or empirical research & methods, + conduct and report on empirical research
- Cycle-based survey model = current topics + empirical research methods + conduct and report on empirical research
- Standard Technology Course model = Tools and technologies + Design, build and test an application
- Advanced topics in HCI model = current topics + tools and technologies

Using the syllabi described above, we recorded every assigned reading for each course. If the assigned readings were not available on the syllabus we emailed the instructor. After combining very similar readings such as textbook chapters we ranked the final list of readings in terms of frequency assigned. The list contains books and articles that introduce characteristic HCI, human centered sensibilities (e.g., Norman's *The Design of Everyday Things*), as well as those that offer overviews (e.g., Dix et al's, *Human Computer Interaction*) and those that present particular perspectives with accompanying methods (e.g., Card, Moran and Newell's *The Psychology of Human-Computer Interaction*), Specific methods are regularly offered, some like Rettig's *Prototyping for Tiny Fingers* that clearly reflect what is happening in the technological landscape. Classic content heralding new ways of thinking about the world are present; e.g., Bush's article *As we may think,* and Weiser's *The Computer for the 21st century*, the piece that launched pervasive and ubiquitous computing are routinely recommended to students.

Themes: Opportunities and Tensions

Our data reveal a number of interesting themes that we think are relevant for consideration.

1. Finding a balance between unity and interdisciplinary
Many of our survey respondents and interviewees called for some form of "unity" or consensus when considering what HCI is as a discipline. Comments in our surveys include statements that suggest a desire for *"a unified theoretical perspective"* and *"a common curriculum".* There was concern that a lack of commonality in training/course structure leads to lack of a *"common valuation of an HCI degree."* For many of our community (educators, students, hiring managers), a lack of consensus and clarity about the value of a degree in HCI is of course concerning. Indeed, our participants clearly expressed that unity is desirable for two related reasons: (1) Concretely, a standardized curriculum or degree would help students select programs and teach industry professionals what to expect from the students that they hire, and (2) Participants also realize

that a more unified perspective would make it easier to advocate the value of HCI as a discipline in general, noting, *"a common language seems to be lacking."* In other words, we have failed to clearly state the value proposition of having a strong education in HCI as a discipline, despite there being clear value associated with the skillsets that students in HCI develop.

While a concern was expressed about sending clear messages regarding the value of HCI and what core perspectives are represented within the disciplines and/or inculcated as part of student learning, our survey and interview participants are very clear that HCI is, and should, be essentially multidisciplinary. HCI is an interdisciplinary field, drawing on research from psychology, computer science, design, anthropology, information science and others. As one usability manager writes, *"It is hard to learn the core skills in one place or department."* A student expresses a similar sentiment, noting *"Interdisciplinarity is very important, and not just from a 'I'm going to include someone else on my project' perspective...but it's important that our students be competent in more than one area."*

Many participants point to the social sciences as increasingly relevant fields. In the words of one, *"I don't like saying 'old HCI' because it is all still current and relevant and we don't do it right. But the set of interdisciplinary domains that we're drawing is much more restricted...and social sciences can help."* A related challenge worth noting is the need *"to respect different epistemological differences."*

2. A divide between academia and industry

Another reoccurring theme is a perceived divide between academia and industry. As a group, students are especially concerned. In the words of one, *"I think the divide between practitioner and researcher is growing and this is becoming apparent in HCI education. While most of the professors are coming from academia, they need to understand the differences between the two worlds in order to best inform their students who may be going into either world."* Another worries about competing: *"we are quickly moving beyond where a capable student with a team of researchers can compete with industry."*

Many academics mirror these concerns, often on their students' behalf. The opinions of industry practitioners are divided. One lists *"Isolation of academics and perceived irrelevance (often warranted) by practitioners"* as a key challenge that HCI needs to overcome. Another asserts, *"Practitioners need to have that rigor [of academia],"* but qualifies *"I don't trust that academics really understand what's going on." Therefore, It seems clear that while some level of mutual respect exists, the perceived divide between academia and industry is acknowledged by practitioners, professors and students–students in particular worry about differences in skillset demand and the consequent implications for*

career trajectories

3. The role of computer science in HCI education
As HCI has strong roots in the field of Computer science, one enduring question in HCI education is the nature, level and depth of the computer science related technical skills that HCI students are required to learn. For example, some believe that every student should learn basic programming; as one computer scientist reports, *"I am discipline centric enough that I believe everyone, not just those in CS, should know what a loop is."* A user experience architect agrees on the grounds that *"being able to know their language and talk to them very directly enables you to have credibility"*. On the other end, one UX instructor chose to pursue an MS in Library and Information Science because *"If I had done computer science they would have made me do programming, which I felt was totally irrelevant to HCI".*

A closely related tension exists between computer scientists and non-computer scientists, or *"people who program and those who study people who program (i.e., because they can't program)."* According to one computer scientist, HCI *"doesn't always get respect from traditional CS faculty; it's still viewed as a question of (inessential) aesthetics."* Another notes the difficulty in making computer science students understand HCI: *"you first have them build a system... and then you show them that what they built was not a good interface in terms of usability."*

4. A standardized or flexible curriculum
One theme that emerged early in our research was the question of how structured and how flexible an HCI curricula should be. One professor pragmatically notes*, "The problem is that they're not going to be deep in everything. It's not a problem as long as the economy is running fairly smoothly. But for students who have multi-disciplinary things…when the going gets tough, they strip it to the bare bones. Which is technology. And design, but technology…[company x] hired 15 interaction designers last year. It's our responsibility to be a bit boring."*

A second professor believes that students with diverse portfolios are more likely to succeed. *"The tradeoff is: do we think there should be a body of scholarly knowledge that everyone should know, or are we training them in different areas of practice so they can go out in industry and do whatever? I'm learning toward the later because it's hard for me to stomach sitting in front of them and saying they have to know this stuff because it's good for them. They're going to want those experiences to be more valuable."*

5. Breadth and depth in HCI
As with all research domains, concerns were raised the balance between breadth

and depth in HCI education. One professor summarizes the issues as follows: *"What a good PhD student should know in terms of breadth - that's the most problematic piece. Because one of the problems is that when you finish your PhD you are the world's smallest expert in this particular topic...it's such a limited point of reference. It makes students feel more fragmented than connected, and that's a problem."* In some ways, encouraging a broad curriculum can lead to a more unified theoretical perspective. A broad curriculum also encourages diverse ideas from *"people who are versed in multiple perspectives."* In contrast, one advocate for depth believes *"The challenge is students might come away with a broad set of skills that they are decent at instead of a few things that they are expert at...HCI education as the core discipline may not emphasize the depth part enough."* Another notes, *"You get a PhD in HCI, you get a job at an iSchool, or maybe a really advanced Computer Science Department. We have people who need to be aware of this."* Depth is also associated with rigor, and breadth with a lack thereof- commenting on breadth, one lecturer believes *"the top trend is to water it all down and out of the curriculum."*

Summing up …

Tellingly, our results at the highest level echo the observation of Hewett et al from 1992. In that document, the authors state:

> *There is currently no agreed upon definition of the range of topics which form the area of human-computer interaction.*
>
> Hewett et al, 1992

Nevertheless we feel this work offers a strong contribution simply by seeding the conversation around What is HCI? And forces us to address the question, is there a single field called HCI or simply a sensibility that is HCI, where the three elements, human-computer-interaction are all considered to be equally important. HCI may thus be less a set of necessary methods or fixed approaches but a philosophy that is embodied and enacted with contemporary tools and addressing contemporary problems – whatever those may be for the time frame or cultural context of consideration.

We started this article with the statement: "the field of HCI is changing". Given the focus on HCI is on people, technology and interactions with and through technologies, it is likely that the field of HCI will always and necessarily be in flux.

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Appendix A: Supplamentary Data for different populations

This appendix displays the top 10 highest- and lowest-ranked survey items, by population. Rankings were given on a 5-point scale where "5" was designated as "Very Important" and "1" as "Unimportant". Blue designates popular items; red designates unpopular items. Survey items that multiple populations value similarly are displayed in a darker shade.

	General Sample		
	Survey Item	***Category***	***Rank***
1	Mobile	Interface	**4.71**
2	General qualitative research	Emprical research	**4.60**
3	Interaction design	Paradigm	**4.57**
4	Obsevation	Method	**4.56**
5	Interviews	Method	**4.53**
6	Prototyping (general)	Method	**4.53**
7	Internships/ apprentishships	Type of learning	**4.53**
8	Analyzing and applying research	Emprical research	**4.52**
9	Empirical research	Type of learning	**4.51**
10	Practical/ work experience	Type of learning	**4.50**
-10	Change management	Topic	**2.65**
-9	Systems engineering	Subject	**2.64**
-8	Media criticism	Topic	**2.58**
-7	Education	Subject	**2.57**
-6	Machine learning	Topic	**2.52**
-5	Natural language processing	Topic	**2.50**
-4	Robotics	Topic	**2.38**
-3	Probabalistic computing	Topic	**2.29**
-2	Philosophy	Subject	**2.22**
-1	Economics	Subject	**1.99**

	Brazil		
	Survey Item	***Category***	***Rank***
1	Interaction design	Paradigm	**4.86**
2	Interaction design	Topic	**4.78**
3	Usability testing	Method	**4.75**
4	Prototyping (general)	Method	**4.73**
5	Interviews	Method	**4.69**
6	Mobile	Interface	**4.65**
7	Accessibility	Topic	**4.64**
8	Observation	Method	**4.63**
9	Experience design	Paradigm	**4.60**
10	Tablet	Interface	**4.57**
-10	Data mining	Topic	**2.98**
-9	Art	Subject	**2.94**
-8	Education		**2.92**
-7	Probabilistic computing	Topic	**2.88**
-6	Health informatics	Topic	**2.80**
-5	Business	Subject	**2.45**
-4	HCI education prepares students more for industry than academia	Challenge	**2.38**
-3	Philosophy of science	Subject	**2.24**
-2	Philosophy	Subject	**2.19**
-1	Economics	Subject	**2.04**

	China		
	Survey Item	***Category***	***Rank***
1	Mobile	Interface	**4.67**
2	Interaction design	Paradigm	**4.65**
3	Interaction design	Topic	**4.63**
4	Practical/ work experience	Type of learning	**4.52**
5	Experience design	Topic	**4.50**
6	Usability testing	Method	**4.46**
7	Experience design	Paradigm	**4.46**
8	Encouraging Interdisciplinary collaboration	Challenge	**4.46**
9	Ensuring sufficient practice in HCI	Challenge	**4.46**
10	Empirical research	Type of learning	**4.42**
-10	Change management	Topic	**3.15**
-9	Wizard of Oz	Method	**3.08**
-8	Technology theory	Topic	**3.08**
-7	Ethics	Topic	**2.98**
-6	Media criticism	Topic	**2.96**
-5	Philosophy of science	Subject	**2.77**
-4	Education	Subject	**2.75**
-3	A divide between academia and industry	Challenge	**2.73**
-2	Economics	Subject	**2.63**
-1	Philosophy	Subject	**2.50**