Involving End-Users in HCI Education: A Case Study and Steps Forward

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Abstract
Users are at the core of HCI—they are the focus of our designs, evaluations, and HCI pedagogy; however, limited research exists on how HCI/design students engage with end user populations in their coursework. In our CHI'20 paper, we provide a case study of a graduate-level HCI/design course working with children to co-design an interactive STEM learning experience. Our findings highlight communication strategies and challenges, power dynamic issues, and the students perceived value in engaging with users. In this workshop paper, we first summarize our CHI'20 research and then outline key pedagogical and process changes made to the next course offering. We close by describing initial observations between the 2019 and 2020 course. This ongoing research contributes empirical evidence of how HCI students directly interact with users in a formal course context, principles for reflective pedagogy, and the need for more intentional investigation into HCI educational practice.

Author Keywords
HCI education; User-centered design; Children

CSS Concepts
• **Human-centered computing~Human computer interaction (HCI)**;

How do (and should) HCI educators prepare students for the task of working with a wide range of users?

What challenges do HCI students encounter in their design process engagements with end-users?

Figure 1. Children, HCI students, and facilitators sketching ideas

Figure 2. Children providing feedback on a pinball machine

Figure 3. Children playing with Trebuchet

1. Introduction

Involving users throughout a design process is a defining characteristic of HCI research and practice. As such, HCI pedagogy foregrounds the need for HCI students to directly work with users in authentic design settings [3,4,10]. But limited research exists exploring how HCI students interact with target populations in their coursework. In our CHI'20 paper [14], we offer empirical evidence of how HCI students directly engaged with users in their design process, propose principles for reflective HCI pedagogy, and call for more attention to HCI educational practice. In this workshop paper, we begin by summarizing our CHI'20 study and then outline the key pedagogical and process changes made to the 2020 course offering. We close with a preliminary analysis of initial differences between the 2019 and 2020 course based on curricular changes.

1.1 Users in HCI Education and Pedagogy

There exists a rich body of HCI literature in both research and practice that offers methods and techniques for engaging users [18–20], models and stages for involving users [7,9,13,21], and guidelines for working with users [2,8,11,12]. Despite extensive research on involving users in HCI practice, little scholarship discusses *how to* involve users in HCI education and pedagogy. Prior research by Agogino *et al.* [1] and Silveira *et al.* [16] hint at the value of interactions between students and users but offer few details on how students worked with users and challenges or opportunities in their interactions.

Students often involve users in their design projects across contexts [15]. However, there is a lack of nuanced understanding on how students interact with users, particularly users with different identities. During EduCHI 2019, Putnam *et al.* outline five unresolved challenges of teaching accessibility, one of which includes the need for more support in facilitating direct interaction with diverse end-users in addition to drawing on supporting materials. Our research builds on prior EduCHI research by proposing challenges and opportunities in involving a wide range of users in HCI pedagogy. After a close review of HCI literature, we find open questions around how HCI educators expose students to working with and involving users in their design process, which our work begins to address.

1.2 Masters-Level HCI Course Context

To support HCI students in working with users, we established a partnership between a graduate-level prototyping studio course (10-weeks) and a children's co-design team (ages 7-11). Graduate HCI students teams iteratively designed and built a low-cost physical computing STEM learning experience for children. Following Cooperative Inquiry [5], a participatory design method focused on children as design partners with adults, HCI students participated in two co-design sessions with children (Figures 1-3).

CO-DESIGN SESSION WITH USERS

Each co-design session brought together three to four HCI student teams, five to seven children from an intergenerational design team *(KidsTeam UW),* student volunteers and a lead facilitator. Parental and child assent was obtained as part of a larger study and HCI students granted consent as well. Co-design sessions followed a general structure of *snack-time* (15-minutes), *circle-time* (15-minutes), *design-time* (45-minutes), and *discussion-time* (15-minutes). During *snack-time*, children, volunteers, and HCI students had a chance to eat and get to know each other informally.

Figure 4. Child recognizing chia seeds are edible

Figure 5. Child putting hand into chia seed bag

Figure 6. Child eating chia seeds from prototype

For *circle-time*, everyone sat on the floor and shared their name, age, and a question of the day that set up design-time activities. During *design-time*, each HCI student team had a station set up with their prototypes and the children rotated in pairs or trios to each station for 10-minutes each. Finally, during *discussion-time*, the *KidsTeam UW* facilitator led a conversation between the HCI students and the children in sharing likes, dislikes, and design ideas for each prototype.

To understand how HCI students engaged with, reacted to, and reflected on working with users in their design process, we analyzed: video recordings from the co-design sessions (n=8), semi-structured interviews with HCI students after the course ended (n=14), and artifacts from teams' final project documentation. For more details on the study, see [14].

2. Key Findings from 2019 Case Study

We summarize key findings related to communication strategies and challenges, power dynamics, and students perceived value of working with users.

2.1 Communicating with Users

BUILDING RAPPORT WITH USERS TO ELICIT FEEDBACK.
An important aspect of participatory design approaches is rapport building between designers and users [6]. During our co-design sessions, even with the formal time structuring of *snack-time* and *circle-time*, we found that the majority of the HCI students did not focus on rapport building. For example, some HCI students did not attempt to talk to the children or eat together. HCI students and the children often separated into different areas of the room before the facilitator intentionally called them together for circle time. With limited time constraints, one HCI student noted, "*It's really hard to build rapport with them*." We did observe some HCI students try successful strategies to connect with users by smiling, adapting their language to mimic users, and offering friendly embodied gestures.

SESSION MANAGEMENT CHALLENGES AND OPPORTUNITIES.
Planning, running, and analyzing user study sessions is complex [22]. Most prior work emphasizes the planning and post-hoc analysis phases rather than how to execute the sessions themselves. In our study, we found it was challenging for the HCI students to be flexible with their plan and respond dynamically in the moment, especially when children behaved unexpectedly. Further, we found that some HCI students did not know how to react or process when the children used the prototypes in unexpected ways. As one extreme but illustrative example: a team was astounded when a child started eating the supplies (chia seeds) brought for a STEM experiment (Figures 4-6). Moreover, children often provided HCI students with complex, abstract, and unexpected forms of feedback that they struggled to make sense of. For successful session management strategies, we observed HCI students turning group interactions into one-on-one sessions, being explicit with directions or questions, and moving between methods to capture user feedback creatively (*e.g.,* sketching, probes, questioning).

2.2 Complex Role of Power Dynamics

POWER DYNAMICS BETWEEN HCI STUDENTS AND USERS.
Navigating power dynamics between designers and users is a well-known and critical issue in HCI [17]. From our interviews with the HCI students, we learned that many of them had expectations of this subset of users informed by their lived experiences. HCI students wrestled with the tension between their *expectations* of

Figure 7. Children watching a video prototype.

Figure 8. Children playing a space game

Figure 9. Children playing a mirror reflection game with string

how children should act and the *realities* of how they acted in the moment. When engaging with the children in groups, HCI students found it challenging to attend to multiple users. Furthermore, HCI students struggled with positioning user input relative to other stakeholders *(e.g.,* the teaching staff feedback).

POWER DYNAMICS BETWEEN HCI STUDENTS AND ADULTS.
As designers working with multiple stakeholders, HCI students also described the challenge of managing expectations across people. In order for the HCI students to gain access to a vulnerable user population such as children, the course partnered with an existing co-design team that was led by facilitators and volunteers. HCI students expressed the feeling of lack of power in the way the sessions were run because of assumptions about the facilitator. Simultaneously, HCI students recognized the ethical need for the facilitator and adults in the room yet expressed a desire for more agency in the structure of the co-design sessions.

2.3 Perceived Values Through Reflection
NAVIGATING COMPLEXITY WITH USERS THROUGH ADAPTATION.
HCI students reflected on the complexities and value of real-life interactions with end-users. One student said this experience showed her, as opposed to told her, about the need to be more flexible with study guides and interpreting user feedback. After reflecting on the experience through video clips, HCI students recognized the challenges of working with end-users that are different than themselves in real-time and proposed solutions for future action.

AWARENESS OF FUTURE OPPORTUNITIES FOR GROWTH.
HCI students reflected on their professional careers as designers. Students named particular instances of user engagement that they wished to improve on, like getting to know the user population beforehand through research or brainstorming strategies to communicate better in the moment with users.

HCI STUDENTS REMEMBERING AND NOTICING.
An interesting finding was the difference between what the HCI students remembered and noticed about their engagements with the users during their co-design sessions. HCI students shared their perceptions of the experience with the children as they remembered it and responded surprised and nervous after watching their video clips. This finding led us to propose the use of video clips to support HCI students in remembering, reflecting, and enacting strategies for future engagements with users different than themselves.

3. Key Pedagogical and Process Changes

Informed by findings from our CHI'20 study, we proposed and have implemented the changes outlined in Table 1 for our Winter 2020 course. Key changes included: (a) augmenting the participatory design lecture with video clips from a range of 2019 designer-user interactions; (b) asking HCI students to prepare a two-page session plan before their session; (c) providing HCI students with example session plans; (d) embedding activities before and between co-design sessions; (e) facilitating a debrief conversation with the HCI student teams immediately following the co-design sessions; and (f) filtering, selecting, and showing teams video clips of themselves between sessions 1 and 2.

4. Preliminary Observations from 2020 Case

At the time of submission, all teams from the Winter 2020 course have participated in their first co-design sessions. We are noticing three key changes in how HCI

Course Component	2019	2020	Rationale
Lecture on participatory design	A research presentation by facilitator *on KidsTeam UW*	Similar presentation; Augmented with a presentation focusing on sharing clips from 2019 interactions Advice from 2019 cohort	To show HCI students real examples of prior student-user interactions ranging from successful to challenging interactions
Co-design team volunteers	Helped manage sessions, limited open communication	Consistent pairing of volunteers and HCI students; Volunteers have more input during large group synthesis	To connect HCI students more intentionally with volunteers
Individual pre-reflection	Limited	Reflection prompts for HCI students to document assets, brainstorming strategies, and plan for rapport building	To intentionally support HCI students in considering and naming their thoughts going into Session 1
Team mid-term video clips viewing and reflection	Limited	Curating 2-min clips from Session 1 for each team to watch together and reflection prompts to think through their reactions	To help HCI students remember, notice, and reflect on what they learned from Session 1 and consider what they want to change/keep for Session 2
Individual final reflective interviews	As a research protocol	As a way to connect takeaways for professional development	To support HCI students in connecting experience to professional development
Video clip showings	After the course ended	After the first session, after the second session	To scaffold HCI students in seeing and making changes
Project goal	Client-based	Social impact based	To allow HCI student choice and bring game focus to designs
Session timing	Weeks: 2,3 -- 8,9	Weeks: 2,3 -- 7,8	To allow more time for changes to be implemented into the final designs

Table 1. Overview of 2019 to 2020 Course Changes

Figure 10. Children making body movements to match screen

Figure 11. Three children managing controllers for one game

Figure 12. Designer crouching down to ask child for feedback

students engage with users: building rapport, the types of prototypes, and managing design sessions.

HCI students are intentionally focusing on building rapport with the children during snack time, circle time, and throughout the design session. Informed by findings from our recently published paper, we offered the HCI students tangible strategies that might work to connect with the children (*e.g.,* acting silly, relying on the volunteers, and asking them questions about their hobbies and interests). For example, one HCI student from the 2020 course brought a silly hat to engage the children while others have played video games on their phones with the children. This is particularly relevant because the design prompt for this year's course is designing video games.

Second, in contrast to presenting the children with video prototypes or pictures of prototypes (Figure 7), this time HCI students brought prototypes for the children to experience through embodied movements like game pedals. HCI students have brought more interactive prototypes for the children to play with, tinker, and use in unexpected ways (Figures 8-9). The children seemed to be responding positively with large physical prototypes HCI students brought which included making large bubbles, TikTok Tetris, and dancing games (Figures 10-11).

Third, HCI students seem to be managing their session times better. Some HCI students are actively leveraging the expertise of the co-design volunteers and facilitators to communicate with the kids, adapt their protocol, and process abstract children feedback (Figure 12).

5. Conclusion

In closing, as HCI education programs continue to grow and expand around the world there is great need for HCI students to engage in educational experiences that help them develop knowledge of working with real-end users. In our CHI'20 paper, we provide a case study of a graduate-level HCI/design course working with children to co-design an interactive STEM learning experience. In this workshop submission, we provide preliminary observations of the next course offering after making key curricular changes. During the second course offering, we observe key changes in how HCI students engage with users: they are more intentionally building rapport with their users by drawing on communication strategies with children, they are bringing more interactive prototypes that have the children playing and embodying the designs as opposed to simply watching and after creating session plans they are managing their design sessions better.

We call for the use and implementation of additional reflective tools and activities in the HCI classroom to scaffold HCI students in learning how to work with users. As HCI programs continue to grow and as educators explore ways to support their HCI students in learning to engage with a broad set of users in their design process, we believe reflection will serve as a key component of this process. We look forward to sharing our findings from the second version of the course and discussing opportunities for future research in the symposium. We hope the findings and reflection activities highlighted in this workshop paper will serve as inspiration for future HCI educators seeking to support HCI/design students in working with users unlike themselves.

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