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Human-Computer Interaction Research and Education—Crossing Boundaries Between Academic Research and Industry Practices

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Abstract

In this paper, I will discuss my own experience and approaches to enhancing students' learning in Human-Computer Interaction (HCI) classes by adopting an interdisciplinary approach that integrates academic research and industry practice. Due to the inherent interdisciplinarity of HCI, and to foster a set of “soft” skills known in Interdisciplinary Studies as the “cognitive toolkit,” I invite expertise from the other departments at my university as well as industry professionals to give lectures, facilitate workshops, and oversee projects. These collaborations have produced several insights and have had a positive impact on the participants.

1 Introduction

As a post-secondary educator and a computer science researcher in the area of Human-Computer Interaction (HCI), I typically encounter scenarios in which a rich understanding of interdisciplinarity is crucial. While HCI itself is highly interdisciplinary (Burne, 2003; Hewett et al., 1992), in this paper, I will share my own experience from the perspective of the educator in this area of study in conjunction with the research and development projects that I have conducted with industry partners. The foci of the paper will be on how the traditional classroom pedagogical approaches may be enhanced by understanding and incorporating some of the common industry practices in the related areas as well as involving the experts from the other departments within ones academic institution.

2 UI/UX Design in Human-Computer Interaction

The most widely referenced definition of Human-Computer Interaction is arguably the one provided by the ACM SIGCHI Curricula for Human-Computer Interaction:

“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, p. 5)

From this definition, it is clear that this area of study focuses on the interactive computer systems for human use, but how one interprets the three important notions used in this concept, *interaction*, *human*, and *machine*, can lead to a wide variety of possible research topics (Hewett et al., 1992). For example, “interactive machines” can mean any device or system from common computer platforms (e.g., workstations, desktop and laptop computers, mobile phones), or household appliances, to large industrial machinery systems or even airplanes. The phenomena surrounding such machines then range from something like system functionality and efficiency, to human behaviours and psychological aspects of the machine users. It can be single user interaction, multi-users, or even interactions among a group of users. It is thus not unusual to see researchers from many different areas of study such as computer science, engineering, psychology, cognitive science, sociology, and anthropology, working together and attending major HCI conferences such as ACM SIGCHI. User-Interface (UI) and User-Experience (UX) Design are often considered as a subset of the HCI study areas, and often have direct applications in industry and business settings more often than the other areas that focus heavily on the theoretical aspects of HCI. The ultimate goals of UI/UX research projects, especially in the industry settings, are typically the design, implementation, and evaluation of an interactive system that provides the optimal UX for a very specific target user group.

These projects often go through multi-stage design and development processes utilizing the common User-Centred Design (UCD) frameworks, rather than establishing generic fundamental HCI theories. Furthermore, in addition to the aforementioned inherent interdisciplinarity of the HCI studies, these industry-supported Research and Development (R & D) projects often involve aspects beyond the traditional academic boundaries; such areas as marketing, business analyses, communication, customer relations, financing, and management, are examples of facets that one may need to deal with while operating in these types of R & D projects within a for-profit setting.

3 Gap Between Academic Settings and Industry Practices

I have been fortunate to work with industry partners to conduct several UI/UX R & D projects in the past several years. Through these projects, my students in computing science accrue valuable experience, working with experienced industry professionals while gaining insights into some of the academic-oriented research perspectives. On one hand, it is said that being able to conduct interdisciplinary work requires a certain set of “soft” skills, often coined as the “cognitive toolkit” (Repko and Szostak, 2017), which includes such skills/quality as open-mindedness, humility, empathy, and intellectual courage, among others (Fortuin et al., 2013; Styron, 2013; Repko and Szostak, 2017). On the other hand, it is also said that doing interdisciplinary work itself can foster these cognitive skills (Everett, 2016; Styron, 2013;

Ivanitskaya et al., 2002). It then follows that providing students more opportunities in these R & D projects can have a positive spiral effect. Students will get better and better at doing the work involving many aspects of interdisciplinary R & D projects.

This way of thinking is clearly behind the recent movement of many secondary and post-secondary institutions to integrate experiential learning components in their program curricula (Lewis and Williams, 2006; Kolb et al., 2000). However, these types of learning experiences are not always available for all the students seeking them. As well, some of these experiential learning positions are temporarily generated just so that the students can carry on their experiential learning projects but the positions may not stay after the completion of the projects. There are also some cases in which that the collaborations are operated as standalone projects, separately from the partners' regular business operations and thus, the students are not properly mentored or supervised by the organizations' personnel. In these cases, the students may earn academic credits but may not gain the real experience of working with experts or professionals in the fields and addressing practical problems. Internships may involve different situations, especially in that mentorship and supervisions are typically provided by the organizations' personnel. Internship opportunities are, however, still not equally available among students and in different areas of studies (e.g., more opportunities for Business and Engineering majors compared to Communications and English majors (Moss-Pech, 2021)).

Finally, many instructors integrate active learning components to bring in simulated tasks and activities of the real-world into classroom teaching (Bonwell and Eison, 1991). One of the common issues, however, is that many secondary and post-secondary educators do not have extensive professional experience working in the related areas in order to train the students in these tasks and activities. While faculty members do in fact often work with external organizations to facilitate experiential learning programs, students are the ones who are trained in these projects but not the faculty members. It would be ideal, therefore, to combine the academic expertise of university professors and instructors who can digest the complex theories, curate relevant information, and deliver the subject topics in an effective manner, with the real-world experience of industry professionals who can facilitate workshops, activities, and project, and give practical or simulated training sessions for students in class. This approach can then of course be mixed with the existing experiential learning modules, and/or followed by actual internship placements.

4 Integrating Practices from Various University Departments and Industry Into Classroom

In order to facilitate certain interdisciplinary exercises and to bridge the gap discussed above, I make effort to integrate practices from other discipline/departments as well as those of the industry by inviting experts from the appropriate departments within the university and the professionals from some of my industry partners including alumni who have now gained sufficient experience in their respective fields.

4.1 Involvement of Other University Departments

Case 1: Research Ethics Review Board In HCI disciplines, because of the nature of the study topics, it is often the case that human subjects are involved to conduct certain evaluations and testing of the designed products. We, as researchers, therefore, do need certain training on ethical conduct and on how to write applications for the research ethics boards clearance for our research projects. Ethical issues are very important in real-life settings like when one works for a company that deals with sensitive data, but these aspects are often neglected in computer science classes. My intention is to first make computer science students aware of certain ethical issues by bringing the experts in this area, and then to provide practical tasks for my students to work on.

I typically start with discussions of theoretical backgrounds of research ethics and explain why it is necessary to seek the clearance before conducting research involving human subjects. The students will then have active learning workshops facilitated both by myself and industry professionals who have experience in this area in order to complete the ethics review applications for their course projects. The applications are then reviewed by us and our feedback will be given to the student groups. Once the applications are deemed complete, then they will be sent to the university's research ethics review board for the official review processes. They often come back with more feedback, questions for clarifications, and suggestions for corrections. We iterate this process until the board clears all their projects. In this way, the students can experience the practical ethics review application writing processes and then they were evaluated by following the university's official protocols.

Case 2: Teaching and Learning Centre In each year, my HCI class has a theme for their final course projects. The project is to design and implement prototype technological solutions in certain problem domains. Each year's theme is essentially the restriction for a certain problem domain. For example, in the past, we had themes such as "Improve University Students' Life" (for which the students came up with their topics like note-taking apps, efficient class schedule manager), or "Go Green: Help Promote Eco-Friendly Life Styles" (for which they had topics like paperless exam platforms, gamification of recycling habits).

One of these themes was to "Improve Learning." Learning in this case was defined somewhat loosely and broadly to allow for a wider range of project topics, from improving learning environments (e.g., modification to learning management systems, collaborative student support platforms), to more specific topics like learning English vocabulary or learning how to drive in Canada. For this theme, I have collaborated with the university's teaching and learning centre, who provides such services as development of teaching skills and strategies, curriculum and program development, and support for scholarship in teaching and learning. The director of this department agreed to be involved in three ways in my HCI classes; (1) give lectures on topics related to learning (e.g., what is learning, when learning can happen, what aspects of learning may be supported, what are the past and current issues with university learning environment), (2) serve as an expert consultant through the term when students (or I) have questions or would need discussion, and (3) serve as the evaluator of the students' final projects (e.g., sit in for the final presentations and read the final reports to give feedback). They have also agreed to meet with me to have a closing

reflective discussion session for potential future improvements. As in the case of the ethics review board, all the students were given opportunities to interact with the expert in the area, within the typical classroom environment, rather than external internships or typical experiential learning settings.

Case 3: Accessibility Service Centre Similarly to Case 2, another course project theme we had was to design for accessibility. This theme was inspired by Universities Canadas Innovative Designs for Accessibility (IDeA) student competition that takes place annually (Universities Canada, 2021). Our students were encouraged to submit their final projects to this competition. For this theme, we had two expert parties, one was a representative from the competition, who facilitated a half-day workshop session with our students, and the other was the universitys accessibility services centre, who had graciously agreed to help our students as consultants for their projects and then sit in for the final presentations to give feedback to them.

As in all the other project themes, the university research ethics board was involved, but since the subject matter of this theme was more sensitive than the other themes that we have had, the support from the accessibility service centre was crucial in completing the ethics review applications and then in conducting the user studies. Both the accessibility service centre and the ethics review board provided support and expertise way beyond what I alone could have provided in order for our students to progress in their course projects.

4.2 Workshops Facilitation and Guest Lectures by Industry Professionals

In addition to the involvement of the various departments from the university, I have also collaborated with industry professionals to bring their expertise into the classroom teaching. These professionals have extensive experience in their corresponding fields, many from the local industry sector, such as art director, UI/UX designer, business analyst, quality assurance (QA) engineer, AR/VR UI developer, and mobile learning expert. They are invited as featured guest lecturers for certain sections of the course, (e.g., design processes, usability studies) and the others for facilitating themed workshops (e.g., ideation sessions, design thinking, QA and evaluations). We also often integrate certification programs (e.g., IBMs Enterprise Design Thinking Practitioner Badge) as a take-home assignment of the class. The students work towards these certifications and consult us (myself and the industry instructors) when they have difficulties or questions in the process of obtaining the certificate.

Not only these sessions have been invaluable for my courses in terms of students' learning experience and outcome, but also for my own learning and growth as an educator. I observe, and sometimes participate in, these activities in order for me to understand and experience what the students are going through, and when needed, I have many follow-up discussions with these professionals, primarily to improve for future occasions, but also to ask questions for myself to fully understand their practices. Some of the techniques and practices that I had learned by observing and participating in these workshops for my graduate-level courses

have in fact been integrated successfully as a part of my undergraduate courses.

Again, the students are given opportunities to interact with the experts outside of the current academic boundaries (i.e., computer science, in our case) and they gain some applied experience in classroom settings, before they graduate or before they move on to their internship positions. Incidentally, this collaboration with industry professionals has worked as a viable recruiting tool, which allowed them to observe students at various levels in more practical settings for a longer period of time than, say, a typical 30-minute job interview

5 Conclusion

In this paper, I discussed my own experience and approaches to enhancing students' learning in HCI classes within an academic environment. As the topics in HCI domain are inherently interdisciplinary, there is certain need of understanding and integrating some of the interdisciplinarian approaches in our classrooms. Further, while internships and experiential learning programs are great opportunities for students to experience certain aspects of interdisciplinary work in the real-world settings, not all the students are fortunate to have these opportunities. In order to mitigate some of these issues, as educators, we can collaborate with different departments within ones institution to bring in local expertise and effectively integrate some of the industry practices into classroom teaching by inviting industry professionals as guest lecturers and workshop facilitators. By integrating these interdisciplinarian approaches, we can provide all the students with more practical experience than the typical classroom activities, and that, in turn, can foster the requisite cognitive toolkit, desirable for many fields of studies and jobs. This approach can thus create a smooth pipeline from learning essential theoretical knowledge to the more practical preparation for their potential employment opportunities.

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