

Enhancing Human-Computer Interaction and User Experience Education through a Hybrid Approach to Experiential Learning

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ABSTRACT

This paper introduces the concept and implementation of a hybrid experiential learning approach to building a User Experience (UX) Lab at a large public university (the University of Central Florida). The UX Lab @ UCF (UX Lab) is intended to bridge the gap between traditional project-based courses and full-time industry internships to provide Information Technology (IT) undergraduates (and students from other disciplines and levels) with the opportunity to apply their Human-Computer Interaction (HCI) knowledge and hone their UX skills by working in partnership with local companies. Specifically, students work as part-time, paid UX consultants for local companies while receiving guidance, mentoring, and feedback from a faculty mentor and graduate student with expertise in HCI and UX. Thus, the UX Lab contributes to IT pedagogy by providing students with a unique opportunity to apply what they've learned in their HCI coursework to real products in development by actual companies. Our approach complements other pedagogical approaches, such as industry-sponsored project-based courses and capstone courses. In this paper, we describe the conceptual model upon which the UX Lab was built, and the success of the first proof-of-concept project that was recently completed in May 2017.

1 INTRODUCTION

The Information Technology (IT) discipline faces new challenges and opportunities everyday due to fast-paced changes and the rapidly growing importance of technology in our society [9]. These changes not only require IT professionals to adapt but also necessitate that undergraduate IT curriculums adapt to reflect these changes. One way in which undergraduate IT programs have been working to improve their curriculum is to use industry-sponsored project-based learning in the classroom [8]. Such

applied approaches work well for training IT students' skills necessary to enter the workforce [3]. Thus, many accredited IT programs in the United States are trying to incorporate industry partnerships to supplement their curriculum and help students get hands-on experience working on real-world projects [2].

Meanwhile, Human-Computer Interaction (HCI) has been recognized as a core discipline to be included in IT undergraduate education [7]. One domain in which HCI is critically important is User Experience (UX) [4]. As noted by Kuniavsky [4], HCI principles and methods are relevant to UX because they are used to create products that accommodate end user's abilities and goals. HCI and UX are, therefore, important aspects of IT undergraduates' education, and continued effort should be taken to improve students' HCI and UX knowledge, skills, and employment opportunities. To improve the recently ABET (Accreditation Board for Engineering and Technology) accredited undergraduate IT program at our university (University of Central Florida; UCF) and to help students get real-world experience applying HCI principles and methods to the design of software-based products, we created a User Experience laboratory.

The UX Lab @ UCF (<http://www.cs.ucf.edu/ux/>) offers local businesses an opportunity to partner with our university to receive high-quality, low-cost UX services. In turn, client engagements provide students with unique experiential learning opportunities working as UX consultants or interns for the industry partners. Students are trained to apply the concepts and methods learned in their HCI coursework to the enhancement of software-based products that the companies intend to bring to market. The UX Lab provides students with practical experience that is not available through course offerings or internships alone. The novelty and effectiveness of our approach comes from the guidance and mentoring the IT undergraduate students receive from graduate students and faculty members affiliated with the UX Lab. Since small to mid-size companies often do not have the in-house capabilities or expertise in HCI or UX concepts; this mentoring bridge provides valuable benefits to both the industry partners and IT students.

In this paper, we discuss related work and provide an overview of the concept behind the UX Lab. Then, we describe our first proof-of-concept project with the UX Lab's inaugural client and discuss how the project was perceived by both the undergraduate students and the client. We conclude by summarizing the success of the project/lab thus far, and the next steps we are taking to continue to improve the UX Lab.

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2 RELATED WORK

Prior literature has shown 1) the importance of engaging students through interactive exercises and projects when teaching HCI and UX as part of an IT curriculum [1,8] and, 2) the benefits that real-world project experience has on IT students' motivation and learning outcomes [3,5,6]. We briefly discuss each of these perspectives below.

2.1 Engaging Students in the Classroom

Prior work has identified ways in which HCI and UX instruction can be more effective. One approach to enhancing HCI courses is to engage students in interactive exercises and projects. For instance, Bačíková [1] provided recommendations to help design HCI and UX coursework that is more engaging and meaningful to IT undergraduates. Two of Bačíková's recommendations were to 1) involve industry UX experts when possible, and 2) make the course more engaging to students by making the lectures and class exercises more interactive. In addition, Preston [8] demonstrated that real-world projects that are based upon industry practices are crucial for IT students to strengthen their understanding of HCI and other critical IT subjects. Through the use of real-world lab style software courses, students were motivated, and the efforts were deemed successful. The average pass rate improved to 91% with these changes.

2.2 Project-Based Learning

Based on interviews with IT employees, there is a need for students to obtain practical, project-oriented skills and experience in the form of internships and coursework involving experiential learning [6]. The benefits of engaging IT undergraduates in project-based learning have been demonstrated within academia. Laware et al. [5] implemented project-based learning or project-centered learning for courses in the computer technology program at Purdue University. The benefits of project-centered learning were that it helped students 1) obtain practical experience, 2) understand why planning is a critical step during a project, and 3) understand the importance of communication skills, and other soft skills, when working within a team.

Project-based learning is particularly effective in capstone courses [3]. Team-based projects in capstone courses are important for learning teamwork, etiquette, and improving project management skills. Gorka et al. [3] highlighted the benefits of industry-sponsored capstone projects for students, industry partners, and educational institutions. Students benefit from these projects by being more motivated to work on real-world problems and having materials to place in their professional portfolio. The industry partners benefit by receiving solutions at no (or little) cost to them, as well as multiple solutions to consider. Finally, educational institutions benefit by obtaining feedback from industry to improve their programs to ensure graduates meet industry expectations.

3 THE CONCEPT BEHIND AN EXPERIENTIAL LEARNING UX LAB

3.1 Overview

The UX Lab connects both undergraduate and graduate students with local companies through part-time, paid UX consulting engagements. Each project is individually negotiated and led by the faculty mentor who is primarily responsible for the success of the client engagement. Thus, local companies pay students through a university account that is owned by the faculty member within the UX Lab, as opposed to adding students directly to their own payroll as interns. Therefore, faculty expertise plays a large role in companies' desire to work with the students, as they are not only provided with low-cost resources, but also Ph.D. level expertise and oversight provided by the faculty mentor. The faculty mentor is then responsible for putting together a team of students with the capabilities needed to deliver the services requested by the client. Students then provide UX services at a reduced rate (compared to the average \$150/hour for UX consulting companies), while under the supervision and direction of a graduate student and their faculty mentor. This structure affords students the opportunity to apply what they have learned in their HCI coursework to existing (or in-development) products while receiving guidance and mentoring from experts in HCI and UX. Thus, IT student involvement in UX Lab projects provides students with unique practical experience that is not obtainable through their HCI coursework, nor through UX internships that do not provide in-house UX mentoring.

3.2 Guided Experiential Learning

3.2.1 UX Lab Structure. The uniqueness of the UX Lab comes from the way Dr. Wisniewski (co-author on this paper) structures and manages projects to facilitate student learning. Students who apply to work in the lab are matched to projects based on their prior experience and specific interests. Through the UX Lab, they are paid hourly for their work and complete projects while under the supervision and mentorship of Dr. Wisniewski, or in the future, additional faculty mentors experienced in HCI and UX. Undergraduates are directly supervised by a graduate (M.S. or Ph.D. level) student, so they receive additional support and mentoring throughout a given project. This tiered structure reduces the need for micro-management on behalf of the faculty mentor but leaves enough flexibility for bi-directional communication channels between all stakeholders of the project (Fig. 1).

This structure for the UX Lab was chosen to provide undergraduates with a strong experiential learning environment in which they can 1) work within a team with fellow students, 2) receive feedback and mentoring from experts in HCI, 3) work on real-world projects for actual companies, and 4) maintain full-time student status (i.e., maintain a full course load). Thus, UX Lab projects provide an intermediate or hybrid approach between two typical approaches by which students gain HCI or UX experience: project-based coursework and full-time industry internships.

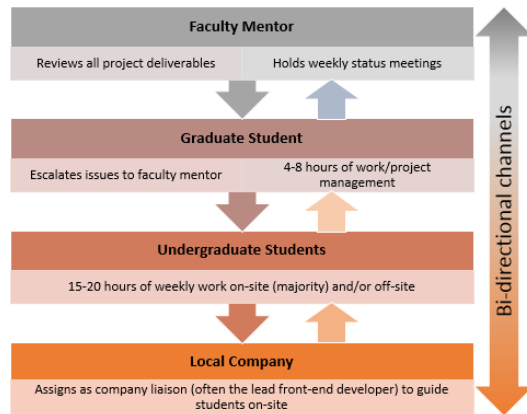


Figure 1: UX Lab structure on a weekly basis.

3.2.2 Benefits over Project-Based Coursework. Project-based coursework is beneficial to students because it provides them an opportunity to apply course principles to more realistic situations while in a controlled learning environment. This approach also allows the faculty to have more control over the structure and outcomes of the projects. This approach, however, is limited in its ability to simulate the challenges faced when working on an actual product for a real company (e.g., shifting priorities, convincing stakeholders). While our approach takes some of the control out of the hands of the faculty, it also provides students with valuable real-world experience and more one-on-one mentoring from the faculty.

3.2.3 Benefits over Full-Time Internships. In contrast, full-time internships immerse students within an organization and provide them with the most realistic introduction to working within an industry setting as an HCI or UX professional. However, full-time industry internships have their own limitations. One important constraint for students is that internships are highly variable in terms of the mentorship provided by more senior HCI or UX professionals. Another limitation is that students are often required to take a semester off from their coursework or to temporarily move for a position. This poses challenges for students who cannot afford to delay graduation or the cost of temporary living accommodations.

In summary, UX Lab projects bridge the gap between project-based coursework and full-time internships by utilizing a hybrid approach that incorporates the strengths of these approaches while mitigating their limitations.

4 CONTRIBUTIONS TO IT PEDAGOGY

The UX Lab is part of a larger initiative, led by Dr. Wisniewski, to enhance HCI education at our university. Our ABET accredited undergraduate IT program currently only requires students to complete one course dedicated to HCI topics and principles. This course is a 4000-level course and, thus is typically not taken by students until the latter half of their undergraduate education. While this provides students with an introductory understanding of HCI topics, principles, and methods, it does not prepare students for entry-level UX careers. As such, our university

recently hired Dr. Wisniewski (a new tenure-track Assistant Professor who specializes in HCI). She has been working to adjust the IT curriculum to enhance HCI education, so that students interested in pursuing UX careers are well prepared upon graduation. First, she proposed that the current 4000-level course be changed to a 3000-level course so that students can be exposed to it earlier in their academic careers. She has also proposed a new 4000-level project-based course in user-centered design. Her end goal is to create a curriculum track of HCI courses designed for students interested in UX-related career paths. The lab thus complements students' HCI coursework and brings what they have learned out of the classroom and into the real world. The UX Lab contributes and enhances IT pedagogy relevant to HCI education as summarized in Fig. 2.



Figure 2: Contributions to IT pedagogy.

5 BENEFITS TO STAKEHOLDERS

We apply HCI principles of user-centered design to present a stakeholders analysis that shows the unique benefits to each party involved in or affected by the UX Lab: 1) Students, 2) Industry Partners, 3) Faculty, and 4) the University as a whole.

5.1 Benefits to Students

There are multiple benefits to IT undergraduate students who participate in the UX Lab. HCI and UX encompass a wide variety of skills, ranging from interpersonal communication skills, leadership and time management skills, technical skills, and design skills. Students have the opportunity to refine these skills so that they are more marketable upon graduation. Furthermore, students are matched to projects in which they can apply their strengths (e.g., design, front-end development, business analyses), while simultaneously improving upon their weaknesses (e.g., lack of research experience). This process is facilitated by creating cross-functional teams with students of different backgrounds and expertise (e.g., IT students with a more technical background may be working with Psychology students who are familiar with user research). Consequently, the UX Lab also benefits students from other disciplines and graduate students.

Another benefit for students is that the structure of the projects allows students to participate while still maintaining a full-time class schedule. The number of hours expected of students can vary from project to project (depending on the client's needs), but

students are restricted to working no more than 20 hours per week to ensure a proper balance between coursework and UX Lab projects. Students also can complete a portion of their hours remotely and at their convenience (e.g., outside of typical business hours) which further helps them to balance their UX Lab obligations with their coursework. Additional benefits to students include expanding their professional portfolio, networking, and the potential for job placement after graduation.

5.2 Benefits to Industry Partners

One of the primary benefits to clients of the UX Lab is that they obtain UX consulting services at a discounted rate. They pay the university, which offloads human resource management tasks, such as hiring and payroll to the faculty mentor and university. In addition, the faculty mentor reviews and approves all deliverables to ensure quality is maintained. This is particularly helpful for companies that do not have in-house UX expertise and resources as it helps ensure they are obtaining quality service and actionable results from the students. The second major benefit to clients is that UX Lab projects can help them to identify talented students for potential hire upon graduation.

5.3 Benefits to Faculty Mentors

Admittedly, the UX Lab structure can be a time-intensive and heavy burden for the faculty mentor because they essentially are responsible for the quality of the consulting services on top of their faculty duties. However, a value proposition for the faculty is that the university has agreed to give credit for dollars brought in through the UX Lab toward tenure and promotion. Another key benefit to faculty is that it increases their future marketability should they want to transition to industry-based UX roles or another HCI academic research position in the future.

5.4 Benefits to the University

Our university highly values partnerships with local industry. These connections may begin as a partnership between the UX Lab and a specific company, but successful projects can open up opportunities for increased company interest in engaging with the university for other needs. Another major benefit is that the IT department and university can use the lab as an opportunity to stay apprised of current and emerging industry needs and trends. This information can help faculty to continually update their HCI coursework to stay at pace with industry. Finally, the UX Lab recruits undergraduates and graduate students from varying disciplines (e.g., Information Technology, Computer Science, Design, Psychology) due to the interdisciplinary nature of UX work, and thus, the lab helps to foster connections and partnerships across different university departments.

6 AN EXAMPLE OF A UX LAB PROJECT

6.1 Project Description

6.1.1 Overview. The UX Lab recently completed its first proof-of-concept project in May 2017 (the project began in August 2016). Bogen Communications, Inc. (a local company specializing in

audio and sound systems; <http://www.bogenedu.com/>) was seeking UX services to enhance the usability of an in-development, non-disclosure agreement (NDA)-protected product. The UX team consisted of a faculty mentor (last author), one graduate student (first author, who managed the undergraduate students), and two undergraduate students. During the project, the team evaluated the usability of a product for three different user archetypes. The process students followed for each user archetype was as follows: 1) create a realistic persona, 2) develop a prioritized list of representative tasks, 3) obtain approval from the client to move forward with user testing based on the agreed upon set of tasks, 4) for each task, conduct a detailed task analysis, 5) perform heuristic evaluations and cognitive walkthroughs, 6) prepare a report detailing the team's findings and recommendations (required creation of wireframes and mockups), and 7) document findings and recommendations into the client's issue tracking software. This process was completed over the course of two semesters. The students also conducted think aloud user testing with company employees who were otherwise unfamiliar with the feature set of the new product.

6.1.2 UX Team Organization and Responsibilities. The undergraduates worked 15 hours per week with the majority of their time (approx. 10-12 hours) spent on-site at the company. The remainder of their hours could be completely remotely. This arrangement ensured students were actively engaged in the project and interfacing with the client while simultaneously granting them flexibility with their class schedules. It also reinforced the need for good team communication especially when work was being completed remotely. The undergraduates were primarily responsible for 1) performing the aforementioned UX services and process, 2) serving as the primary point-of-contact (POC) with the client, and 3) keeping the graduate student and faculty mentor apprised of any issues or concerns.

Mr. Talone (the graduate student) worked 4-8 hours per week (either on-site or remotely) and was responsible for 1) directly managing the undergraduates (e.g., assigning tasks, tracking progress), 2) providing the undergraduates with daily guidance, and 3) obtaining and sharing client feedback with the team. Dr. Wisniewski (the faculty mentor) worked 2-4 hours per week and was responsible for 1) facilitating weekly meetings, 2) providing higher-level guidance, mentoring, and feedback, and 3) managing project logistics (e.g., contract negotiations, budget). Mr. Talone handled the majority of the day-to-day project management activities, so Dr. Wisniewski could focus on providing higher-level guidance and deliverable reviews.

6.1.3 Interaction with Client. Students on the project primarily interacted with a small development team. The team consisted of four individuals with one serving as the primary POC regarding development progress, upcoming development deadlines, and other development updates. Students were expected to maintain a professional demeanor (e.g., dressing appropriately, and being respectful of other employees' time and work), maintain consistent and clear communication with the client (e.g., provide weekly updates on their progress), and work diligently to provide value to the client (e.g., produce deliverables and actionable results in a timely manner). These expectations were established at the

beginning of the project and continually emphasized to the students throughout the project.

6.1.4 *Faculty Mentorship and Guidance.* To facilitate student learning during the project, Dr. Wisniewski held a weekly meeting with the students to 1) ensure that the project was on track, 2) provide feedback to the students, 3) assist with deliverable and presentation preparation, and/or 4) provide HCI and UX resources/expertise. In addition, Dr. Wisniewski was available throughout the week to assist with questions and concerns.

6.2 Evaluating Project Success

Project success was evaluated based on feedback obtained from the students and the client, as described below.

6.2.1 *Undergraduate Student Feedback.* At the end of the project, the two undergraduates were asked to share their feedback regarding the project. One of the students was a senior and graduated during the same semester that the project ended. This student received a job offer as a web developer during the final semester of the project. The other student began the project as a junior and had already completed two full-time internships prior to participating in the UX Lab project.

Table 1 compiles quotes from the undergraduate students regarding how they benefitted from the project. As evidenced by their feedback, the students felt the project benefitted their job marketability, ability to work within a professional setting, skill acquisition (e.g., soft skills), and HCI education. The students also shared feedback regarding how they felt the project could be improved. Areas for improvement included: 1) having a dedicated UX Lab space on-campus for meetings and completing work for the client, and 2) soliciting feedback from clients via alternative methods (besides weekly surveys).

6.2.2 *Industry Partner Feedback.* Feedback from the client regarding the students was solicited on a weekly basis using a

web-based survey (Table 2). The feedback survey included eight items in total (four Likert items and four free response items). The Likert items could be answered using one of four response options: 1=*Unacceptable*, 2=*Below Expectations*, 3=*Met Expectations*, 4=*Exceeds Expectations* (an additional option, “N/A: No deliverables were assigned this week,” was provided for the 4th survey item).

Table 2: Client Weekly Feedback Survey

Questions
1. Attendance: The students attended all scheduled meetings and were on time. (Likert)
2. Professionalism: The students presented themselves professionally and appropriately. (Likert)
3. Communication: The students clearly and promptly communicated with the team. (Likert)
4. Work Products: The students made progress and delivered high quality work products. (Likert)
5. Please provide additional details for ANY time when the students did NOT meet or exceed expectations. If there is a problem with a particular student, please indicate which student here. (Free response)
6. Do you have any concerns or suggestions you would like us to address with the students? (Free response)
7. Do you have any positive feedback about the students? (Free response)
8. Your Name (Free response)

This survey helped the faculty to assess how the students were performing, and identify areas where improvements could be made. In total, we received 24 responses. Fig. 3 provides a summary of the survey responses to each of the Likert items. Overall, the students met or exceeded the client’s expectations during the project.

Upon completion of the project, the client provided the students and UX Lab with a letter of recommendation. The letter highlighted several areas in which the students exceeded the

Table 1: Undergraduate Student Feedback

Benefits	Quotes
<i>Job Marketability</i>	<p>Senior: “The project increased my chances of being hired as a web developer as it was a big talking point during my interview.”</p> <p>Junior: “This was a great opportunity to show future employers I didn’t just take a class in user experience, but employed the material I learned in that class to improve a product of an actual company. I got to network and learn alongside industry individuals, which is a great opportunity so early on in my career.”</p>
<i>Professionalism in a Real-World Environment</i>	<p>Senior: “From a UX perspective, I was able to see how some of our findings could be downplayed as opinions rather than data driven decisions. This was beneficial in that I learned that different people respond to information differently depending on how it’s displayed or presented to them. Understanding this early on in my next project could give me a leg up.”</p> <p>Senior: “The project helped to improve my confidence speaking and interacting in a professional environment.”</p> <p>Senior: “One valuable experience I took from working with the client was how to handle a situation where someone may not agree with your work and to not be discouraged by it.”</p>
<i>Skill Acquisition</i>	<p>Senior: “This project in combination with my studies and other commitments required an improvement to my task prioritization and time management skills.”</p> <p>Junior: “I learned many soft skills that we didn’t have enough time to cover thoroughly in class, like how to give constructive criticism in a way that wasn’t going to offend the development team, how to come across professionally to clients, and making sure we had clear communication with them at all times.”</p>
<i>Application of Coursework to Real-World Projects</i>	<p>Senior: “I was finally able to apply topics I learned in my coursework at the university to actual projects outside of the classroom.”</p> <p>Junior: “Working on the project helped me understand how to apply UX principles I learned in the classroom in industry. For example, the development process of software engineers was very different to the process we employed, and finding a middle ground between the two to be the most effective to the company was something that the class couldn’t really teach and one that was best experienced on the job.”</p>

clients' expectations, which included: 1) the students' subject matter expertise (HCI and UX expertise), 2) professionalism, and 3) ability to produce actionable results.

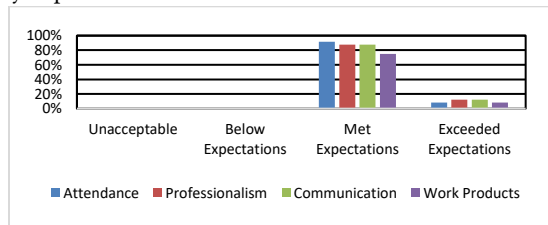


Figure 3: Client responses to weekly feedback survey.

6.3 Lessons Learned

While the inaugural project of the UX Lab was largely successful, there were some valuable lessons learned. First, it took almost a year to negotiate the initial contract due to the project being framed as academic research. By framing new projects as experiential learning experiences, this sped up and simplified the contract negotiation process. Second, a third undergraduate student was initially assigned to the project and had to be replaced after the first semester. We learned that it is crucial that students understand the expectations of each project and that they will be quickly replaced if there is a lack of fit with the project team or client. Third, students, at times, felt uncomfortable providing constructive criticism regarding the client's product, as they were unsure how the client would react to their recommendations. We found that it is important to encourage students to speak their mind and be open to defending their recommendations, as this is a normal part of working within a team.

7 CONCLUSION

Engaging IT undergraduates in real-world projects to assist companies in enhancing the UX of their products is a valuable mechanism by which experiential learning can be facilitated. In this paper, we described the development of a UX Lab intended to enhance undergraduate IT students' HCI education. Overall, the first proof-of-concept project for the UX Lab was a success. The students were satisfied with the experience they gained (with one obtaining a full-time job upon graduating the following semester). In addition, the students consistently met or exceeded the client's expectations and were noted as significantly improving the UX of their product. Finally, the project helped form a stronger connection between the university and the client's organization, with the client expressing interest in engaging in future collaborations with the UX Lab.

The results of the UX Lab's inaugural project demonstrate that our hybrid approach to experiential learning provides a unique bridge between traditional project-based coursework and full-time industry internships. In terms of next steps for the UX Lab, we recently acquired dedicated lab space for future projects. We are

also developing formal student assessment instruments (e.g., surveys) that can be used to better gauge the impact the UX Lab has on students' education and professional development. In addition, we are working with the university to see if students who participate in the UX Lab can also receive course credit for their time/effort. Dr. Wisniewski is now working with a local start-up company, who is bringing a new product to market at the end of this year. Thus, the UX Lab and the student team assigned to the project will be an integral part of the product launch and the ultimate success or failure of the start-up company.

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