Assessing the Implementation of Authentic, Client-Facing Student Projects in User Experience (UX) Education: Insights from Multiple Stakeholders

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ABSTRACT
User Experience (UX) is often cited as one of the fastest growing occupations, creating opportunities across nearly every sector for individuals skilled in the application of user-centered design principles and methods. Many Information and Library Schools have responded to this demand by introducing more UX coursework into their curriculum, but the proliferation of agile software development and lean product design has incentivized organizations to look for experienced individuals for UX roles, even those that are considered entry-level. As a result, aspiring information professionals face a paradoxical situation in which they are required to *have* UX experience before they can *gain* UX experience. This article provides an assessment of one institution's efforts to overcome this experience gap by offering opportunities for students to participate in three types of authentic client-facing UX projects. Through surveys of students and clients served over four academic years, we provide a set of lessons learned and recommended best practices for incorporating project-based learning opportunities into UX courses.

Keywords
HCI; user experience; education; project-based learning.

INTRODUCTION
With digital technologies now fully integrated into most people's personal and professional lives, organizations across nearly every domain are beginning to prioritize User Experience (UX) as a key competitive advantage (Rosenberg & Daniel, 2014). The UX profession is therefore often cited as one of the fastest growing and most highly paid occupations (Baldwin, 2013; Glassdoor, 2015), creating a wide array of new opportunities for individuals with knowledge, skills, and abilities related to user-centered design (Onward Search, 2014). However, with those opportunities comes added pressure to keep pace with the rapid technological advancements and their associated changes to how interactive technologies are designed, evaluated, and implemented (Churchill, Bowser, & Preece, 2013). In turn, employers now seek individuals with previous experience for UX roles, even for entry-level positions. Thus, students and aspiring information professionals are faced with a so-called "experience paradox" whereby they are required to *have* experience before they can *gain* experience (Gonzalez, Ghazizadeh, & Smith, 2014).

Overcoming the experience paradox poses a unique challenge for UX education. Educators are already tasked with both deepening and broadening the scope of the UX curriculum to cover an increasingly diverse set of skills and knowledge areas (Faiola, 2007). Now, educators must also seek more and better ways to integrate practical, real world projects into their courses (Fernandez, 2004; Henneman, Ballay, & Wagner, 2016).

In this paper, we describe and assess one institution's efforts to address this challenge by integrating three types of authentic client-facing projects into a graduate-level UX curriculum: course-embedded projects, course-long projects, and extracurricular projects. Project experiences are examined from the perspective of student participants, client participants, and the instructor, with the goal of determining the extent that client-facing projects can bridge the "experience gap" by providing students with opportunities to apply UX methods in real world contexts.

LITERATURE REVIEW
Researchers have evaluated many different approaches to teaching user-centered design, UX, and related concepts from Human-Computer Interaction (HCI). Some examples include examining the effectiveness of using crowd feedback to inform students' iterative design process (Dow, Gerber, & Wong, 2013), assessing the benefits of teaching HCI to a novice audience using the book "Zen and the Art of Motorcycle Maintenance" (Harper, 2016), and using a studio-based approach inspired by architecture education (Reimer & Douglas, 2003). Others have explored

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innovative ways to introduce a sense of "authenticity" into UX courses. In one example, educators developed a learning activity called the "prototype walkthrough" in which students presented in-progress prototypes to the class to simulate the real world design practice of studio critiques (Hundhausen, Fairbrother, & Petre, 2012). In another, educators developed an approach called "the panda hat of doom" in which student presenters drew from a stack of cards listing various "doom" scenarios that could happen during a professional presentation and were forced to wear a plush panda hat as they attempted to complete the scenario (Hunsucker, Gobbo, Stallings, & Siegel, 2016).

A more common approach for providing authentic experiences in the classroom is through the use of problem-based learning, which puts the process of problem solving at the center of the learning experience, or project-based learning, which emphasizes the creation of an end product or deliverable (Kokotsaki, Menzies, & Wiggins, 2016). While there have been several individual attempts to incorporate problem-based learning into UX learning contexts (Koutsabasis & Vosinakis, 2012; Nordahl & Serafin, 2008), most UX educators have adopted a project-based learning pedagogy – or, what may be more accurately called "project-led problem-based learning" (Hanney & Savin-Baden, 2013) – through client-facing projects that serve as a form of "service learning" for students (Mankoff, 2006). These service learning experiences have been shown to help students better understand the trade-offs required in real design projects (Lazar, 2011), provide students with extra motivation to deliver quality work (Lasserre, 2011; Ritter, 2014), and help students build a stronger work portfolio (Shneiderman et al., 2006). On a more practical level, the uniqueness of these projects is an effective way to prevent plagiarism (Ritter, 2014). In short, service learning experiences have shown to be an effective way of offering students authentic, real world UX experience, though it should be noted that most of these studies focused on undergraduate HCI courses in computer science programs and covered only one type of project. The current study is among the first to assess the implementation of multiple types of client-facing projects within the context of a graduate-level UX curriculum in the information/library science domain.

METHODOLOGY

The researchers developed two questionnaires for this study: one questionnaire was developed and administered to students/alumni who had participated in a client-facing project and a separate questionnaire was developed and administered to the primary representative from each client organization who liaised with the student team. A survey research methodology was selected because it allowed the researchers to optimize data collection for the populations in the least intrusive way. It also allowed for use of the retrospective pretest technique in the students/alumni survey. For this technique, after engaging in a particular experience or intervention participants are asked to first report their *current* levels of knowledge, behavior, or interest. Next, participants are asked to report their perceived level of knowledge, behavior, or interest *prior to* the experience or intervention; this second measure is the retrospective pretest (Pratt, McGuigan, & Katzev, 2000). Compared to traditional pre/post testing, the retrospective technique is considered more convenient since there is only one data collection period, more accurate since it enables participants to reflect on their growth over time (Pohl, 1982), and more reliable since it reduces the possibility of response shift bias (Howard, 1980).

The students/alumni survey was designed to elicit information from students about their experience participating in a client-facing project. The survey prompted students/alumni to answer the same questions for each type of client-facing project for which they self-reported their participation: a course-embedded project, a course-long project, and/or an extracurricular project (more details on these project types is presented in the next section). Next, respondents were asked to rate their knowledge, skills and interest level both *after* and *before* participating in the project (the retrospective pretest). From relevant literature, the researchers identified several indicators of effective project-based learning opportunities: knowledge of core concepts (Kokotsaki et al., 2016), interest in the topic/domain (Lasserre, 2011; Shneiderman et al., 2006), confidence in applying core concepts (Helle, Tynjälä, & Olkinuora, 2006), ability to work within real-world time/resource constraints (Lazar, 2011), ability to interact with clients (Ritter, 2014), and ability to work effectively in teams (Hanney & Savin-Baden, 2013). Then, respondents rated their overall satisfaction with several aspects of the project experience, such as the amount of opportunities for self-reflection (Mankoff, 2006; Ritter, 2014), the sense of authenticity or "realness" of the experience (Webster & Mirielli, 2007), and the supportiveness of the learning environment (Warren, 1988). Next, they were asked to describe the most important thing they learned from the experience. To conclude, respondents were asked about their perceptions of the overall value of client-facing projects in their education and whether they received a job or internship based on their experience.

The client survey was designed to elicit information from the primary representative from the client organization about their experience participating in a student project. First, respondents were asked to rate whether several aspects of the students' work met expectations. Next, they assessed the level of involvement in the project and rated their overall satisfaction with the students' work. Finally, respondents were asked to explain how, if at all, their organization had benefitted from the project, whether they used or planned to use any of the students' ideas, and whether they would participate in another student project.

Both surveys were administered online using SurveyGizmo. A solicitation message was sent via email to 87 students/alumni and to 25 clients who were project

participants at some point between the 2012-2013 and 2015-2016 academic years. A reminder message was sent 10 days later to anyone who had not yet responded. Messages to one student/alum and three clients could not be delivered due to invalid email addresses.

To contextualize the results, we begin by describing each project type and providing brief vignettes of recent projects. Results are then discussed separately from the students/alumni and client perspectives. Finally, we discuss the projects from the instructor's perspective by offering recommended best practices for integrating client-facing projects into UX curricula.

PROJECT TYPES

As mentioned previously, this research addresses three distinct types of client-facing projects: course-embedded projects, course-long projects, and extracurricular projects. Below, we provide sample project vignettes to further explain the nature of each project type and highlight key differences in their implementation. For additional context, all of the participating students were enrolled in Pratt Institute's graduate (masters-level) program in information/library science, where all courses are offered in a face-to-face setting at the institute's Manhattan campus.

Course-Embedded Project

Course-embedded projects refer to projects that students completed to satisfy a portion of their overall course grade. Specifically, course-embedded projects took the form of an assigned usability study conducted on behalf of an outside client in which teams of 3-5 students were responsible for planning the study with respect to the client's goals and objectives, recruiting participants, moderating usability test sessions, analyzing data, and writing and submitting a formal report with major findings and recommendations for improvement. From start to finish, these projects lasted between 6 and 8 weeks. The project has been included as an assignment in a graduate-level usability course every fall and spring semester since spring 2014. In that time, 61 students have participated and delivered usability evaluation reports to 17 clients spanning the non-profit, library, museum, archive, government, financial, and start-up sectors. In spring 2016, the project was modified to add more interaction between students and clients and now includes three student-client interactions: a kick-off meeting to outline project goals and expected outcomes, a check-in at the halfway point to review progress, and a final presentation held in the final class session.

Project Vignette: NYC Open Data Portal

The New York City Open Data Portal, a key aspect of the city's "Open Data for All" initiative, is a groundbreaking effort to promote government transparency and accountability by providing public access to over 1,400 data sets from over 80 city offices and agencies. In spring 2016, the School of International and Public Affairs (SIPA) at Columbia University launched a collaboration with the city to gain a better understanding of the pain points and barriers faced by non-technical users of the data portal. As part of this project, SIPA sought outside experts to evaluate the usability of the portal's interface. A group of four students from a graduate-level usability course at Pratt Institute worked with a SIPA representative to conduct a usability evaluation of the portal for their final class assignment.

From mid-March through early May 2016, the student group planned and implemented a usability study with 16 participants, including 4 in-person moderated sessions recorded with the LookBack usability software and 12 remote unmoderated sessions conducted through UserTesting.com as part of their university partnership program. The students developed and administered pre-test and post-test questionnaires and used the think aloud protocol to elicit feedback directly from participants as they attempted to use the portal to complete one task focused on finding a specific dataset and one task related to using the portal's built-in data visualization tools. Overall, students found that participants had generally positive impressions of the portal but struggled to understand the full scope of the portal and complete basic tasks. They offered four recommendations to improve the overall usability of the site for non-technical users (e.g., add stronger labels and better prompts to help non-technical users find relevant datasets). The students compiled their results and recommendations into a formal usability evaluation report, which they submitted to the SIPA representative and to the course instructor. In a change from previous semesters, students also delivered a face-to-face presentation with SIPA during the final class session. However, only the evaluation report was graded by the instructor, determining 20% of the students' overall course grade.

Course-Long Projects

Course-long projects refer to projects that lasted the entire duration of a course and determined the majority of students' course grade. In this case, course-long projects were completed as part of a graduate-level course titled Projects in Information Experience Design. The primary goal of this course is to offer students practical, hands-on experience applying user-centered methods to solve a real-world problem for an outside client. Guided by the "inspiration, ideation, implementation" design thinking framework (Brown, 2008), students in this course conduct discovery research and stakeholder interviews to understand the organization's challenges, apply collaborative brainstorming to explore potential solutions, and develop a set of desirable, feasible, and viable proposals for the organization to consider. The course has been offered twice, in spring 2015 and summer 2016, and included the participation of 18 students (nine in each semester) and two cultural heritage organizations.

Project Vignette: Intrepid Museum

The Intrepid Sea, Air & Space Museum is a non-profit educational and cultural institution located in New York

City. As part of its mission to promote awareness and understanding of history, science, and service, museum leaders recently launched a multi-year project to improve the visitor experience and grow the museum's audience. As part of these efforts, the museum agreed to participate as a client in the Projects in Information Experience Design course at Pratt Institute in summer 2016.

Through bi-weekly four-hour class sessions from May-June 2016, the course instructor and nine students engaged in an intensive research and design project aimed at exploring ways to improve the museum experience specifically for international visitors. The students began by conducting stakeholder interviews with two key museum staff members, who outlined the major challenges they face in engaging with international visitors and shared relevant data and statistics from their internal program evaluation efforts. Next, the students split into groups to conduct discovery research, which included a competitive analysis of organizations both inside and outside the cultural domain, a content analysis of user reviews from TripAdvisor, Yelp, Facebook, and Twitter, a wayfinding audit of museum signage, a heuristic evaluation of the museum's online ticketing interface, interviews with 19 museum visitors, and 10 hours of museum observations. After a check-in meeting with the client, the class used collaborative brainstorming and sketching exercises to iteratively develop three proposals: a color-based iconography and navigation system to provide universal wayfinding aids, interactive prototypes for a revamped web interface and new kiosk-based interface for purchasing tickets online, and recommendations for an improved visitor's guide and standardized wayfinding system. Students delivered their proposals in an on-site presentation with museum staff and the museum leadership team. Students also provided extensive documentation of their research and analysis to aid future implementation efforts. Course grades were determined by the group's achievement of interim milestones (30%), the quality of the group's final presentation and deliverables (40%), a deliverable telling the story of each student's contributions to the group's project (20%), and each student's participation (10%).

Extracurricular Projects

Finally, extracurricular projects refer to projects that students completed outside of their regular course requirements. Since they were not connected to any individual course, extracurricular projects were designed to satisfy the needs of each individual client rather than serve specific educational objectives. As a result, projects ranged from 8 to 12 weeks in duration, involved teams of 3 to 8 students, and incorporated a variety of different design and evaluation methods, from summative and formative usability studies to user research, persona development, and prototyping. Six extracurricular projects have been completed since spring 2013 involving a total of 24 students (some of whom participated in more than one project). Clients for these projects included a cultural heritage organization, a university research team, a school of continuing education, two start-up companies, and a large media organization. Three of these projects were completed for a modest consulting fee while the remaining three were provided pro bono.

Project Vignette: The Press Play Project

The New York City Media Lab is a university consortium dedicated to spurring innovation in research and development and strengthening relationships between industry and academia. With backing from the NYC Economic Development Corporation, one of the organization's primary roles is facilitating collaborative research projects between its corporate members and local universities. These "seed projects" enable companies to work directly with a team of faculty and students to explore an area of interest. In fall 2015, Pratt Institute was invited to partner with a major media company on the "Press Play" project, a funded project aimed at improving the experience of watching videos on the mobile web.

Featuring a team of four students led by one faculty member (the first author), the Press Play project ran for 11 weeks between October and December, 2016, and featured weekly team working sessions and conference calls with the client. The first project phase sought data on users' preferences for watching videos on mobile devices. With guidance from the faculty leader, the student team analyzed internal mobile video viewing data, conducted a one-week diary study with 7 participants, held interviews with 11 participants, administered a survey to 98 mobile video users, and analyzed six competing mobile video platforms. From these efforts, the team identified several insights about users' mobile video preferences and developed six unique personas. In the second phase, the team explored interface solutions to the identified pain points through iterative design of paper and digital mobile prototypes. The final product was a walkthrough video showcasing a new mobile web interface that featured a cleaner display of video content, more accurate and descriptive video metadata, and unique personalization options to drive user engagement with relevant content. Students delivered their final proposal in an on-site presentation to company staff and provided extensive documentation, including prototype files and all of the raw research data collected.

RESULTS: STUDENTS/ALUMNI

The students/alumni survey received 59 usable responses out of a possible 86, resulting in a 68.6% response rate. Within this sample, 44 respondents indicated participating in a course-embedded project (44 of 61; 72.1%), 16 indicated participating in a course-long project (16 of 18; 88.9%), and 12 indicated participating in an extracurricular project (12 of 24; 50.0%). Note that these percentages do not add to 100% since some students participated in more than one type of project. While a majority (45 of 59; 76.3%) reported participating in one type of project, 13 (22.0%) reported participating in two types of projects, and

one reported participating in all three types of projects. Finally, respondents indicated working with 23 of a possible 25 clients, which indicates that the response sample is representative of the target population.

Results from students/alumni survey are presented in four parts: retrospective pretest, satisfaction with project participation, lessons learned, and overall perceptions.

Retrospective Pretest

The retrospective pretest data was analyzed separately for each project type. Using the statistical package R, we calculated the mean before and after scores provided by the respondents for eight indicators. We then conducted a one-sided exact Wilcoxon Signed Rank Test, the non-parametric alternative to the paired samples t-test. To control the false discovery rate and account for possible dependencies, p-values were adjusted using the Benjamini-Yekutieli method. Table 1 presents results for all three project types.

Overall, respondents who participated in a course-embedded project (a client-facing usability study) reported statistically significant improvements on all eight indicators: their knowledge of UX concepts/methods, their ability to create quality deliverables, their ability to work in teams, their ability to work with clients, their ability to work within time/resource constraints, their ability to manage the "messiness" of real world projects, their interest in UX, and their confidence in applying UX methods.

Respondents who participated in a course-long project (a client-facing design research project) reported statistically significant improvements on seven of the eight variables, with "my interest in UX" being the only exception. In this case, the relatively high "before" score for this variable (4.63) is indicative of the fact that nearly all students participating in a course-long project had completed a UX course and were already interested in the topic.

Notably, there were no statistically significant improvements on any of the eight indicators related to respondents' participation in an extracurricular project. This lack of statistical significance seems primarily driven by the small number of respondents who reported participating in this type of project. Another important factor is that unlike the other project types – which were structured relative to course goals, adopted a similar methodology, and followed roughly the same schedule – each extracurricular project was uniquely designed to meet the goals, expectations, and timelines of the client. In other words, we do not interpret the lack of statistically significant results for this project category to reflect a low impact of these projects on students' knowledge, abilities, and interests; instead, it is likely a byproduct of grouping all "extracurricular projects" into a single category and treating them as equal despite their inherent differences. In the future, we will explore alternate methods for evaluating the impact of these projects on a more individualized basis.

Overall, the above results indicate that participation in client-facing projects led to positive improvements in students' UX-related knowledge, abilities, and interests.

Satisfaction with Project Participation

Next, respondents were asked to rate their agreement with

Indicator	Course-Embedded (n = 44)			Course-Long (n = 16)			Extracurricular (n = 12)		
	Before (mean)	*After (mean)*	*p-value (adj)*	*Before (mean)*	*After (mean)*	*p-value (adj)*	*Before (mean)*	*After (mean)*	*p-value (adj)*
my knowledge of UX concepts and methods	2.77	4.05	< 0.001*	3.50	4.38	0.017*	3.25	4.42	0.170
my ability to create quality deliverables for clients	2.86	4.11	< 0.001*	3.38	4.63	0.008*	3.00	4.25	0.176
my ability to work in teams	3.91	4.18	0.038*	3.94	4.44	0.027*	3.67	4.42	0.176
my ability to interact with clients	3.14	3.64	0.002*	3.27	4.00	0.017*	2.92	4.00	0.176
my ability to work within time/resource constraints	3.93	4.25	0.005*	3.50	4.38	0.008*	3.58	4.42	0.226
my ability to manage the "messiness" of real world projects	3.02	3.98	< 0.001*	3.50	4.25	0.027*	3.00	4.00	0.265
my interest in UX	3.95	4.41	0.017*	4.63	4.81	0.679	4.00	4.50	0.265
my confidence in applying UX methods	2.64	4.41	< 0.001*	3.69	4.56	0.008*	2.83	3.83	0.176

Table 1. Retrospective pretest analysis for students/alumni. Each indicator was rated on a 1-5 scale where 1=Low and 5=High. P-values marked with an asterisk (*) are statistically significant.

six questions about specific aspects of their client-facing project experience. Table 2 provides mean scores for these six questions across the three project types.

Importantly, these scores indicate that the vast majority of students felt that their participation in a client-facing project was a positive experience, with mean scores ranging from 4.38 to 4.67 across the three project types. Other positive results are that most respondents felt that they completed the project in a supportive environment (mean range of 4.34 to 4.44) and that they felt a sense of pride and ownership of their chosen project (mean range of 4.08 to 4.38). Further, most respondents felt that the course-long projects and extracurricular projects felt sufficiently authentic (mean scores of 4.25 and 4.08, respectively). Course-embedded projects were rated slightly lower in terms of authenticity, which is to be expected given their status as a class assignment. As mentioned previously, this project was changed recently to incorporate more student-client interaction, which should boost the perceived authenticity of these projects going forward.

While the results as a whole are positive, they also indicate two potential areas for improvement: opportunities for reflection and amount of client interaction. These areas are not unrelated; one of the biggest challenges of incorporating client-facing projects into a learning environment is devoting sufficient time to both reflecting on what is being learned and communicating with the client to ensure goals and expectations are being met, all while ensuring the actual project work gets completed. This challenge is practical as well as pedagogical in nature: how do you incorporate client interaction into a classroom setting without disrupting the learning environment? Likewise, how do you incorporate opportunities for self-reflection into a tightly managed project timeline that is driven by client demands and timelines? These are critical questions for future research in this area.

Lessons Learned

Respondents were also asked to describe the most important thing they learned from their participation. The open-ended responses to this question were analyzed using the constant comparative method (Glaser & Strauss, 1967), which consists of reading and re-reading through textual data and iteratively grouping it until coherent themes emerge. Data were analyzed separately for each project type.

Respondents who indicated participating in a course-embedded project identified six important takeaways from their experience. First, several participants cited the simple benefit of gaining practical experience designing and implementing a usability study from start to finish. Second, participants thought the added responsibility of working with a client taught them how to balance client expectations with practical needs. Third, participants mentioned learning how to make their work more impactful by offering direct, actionable recommendations. Fourth, participants said they learned how to communicate with clients and tactfully deliver critical results in a productive and constructive manner. Fifth, participants cited the benefits of learning how to manage group dynamics and communicate more effectively with their teammates. Finally, participants identified learning specific lessons about project management and usability testing that they found valuable, such as the importance of having back-up plans, how to record user testing sessions, and how to write formal evaluation reports. As one respondent summarized:

"The project was good for putting concepts we were learning into practice - it was [also] helpful conducting proper usability tests, and understanding all the nuances that go into making them successful and effective."

Respondents who participated in a course-long project identified four major takeaways from their experience. First, participants learned how to effectively communicate with clients to discover their true needs and understand their expectations. Second, participants learned how to overcome issues of group dynamics and collaborate effectively in a team environment. Third, participants learned the importance of "satisficing" when trying to meet client needs on a tight deadline, which required balancing tradeoffs and delegating work to their teammates. Finally,

Question	Course-Embedded (n = 44)		Course-Long (n = 16)		Extracurricular (n = 12)	
	n	*Mean*	*n*	*Mean*	*n*	*Mean*
Participating in the project was a positive experience.	43	4.40	16	4.38	12	4.67
I had enough opportunities for self-reflection or de-briefing. (r)	44	3.66	16	3.25	12	3.00
I completed the project in a supportive environment.	44	4.34	16	4.44	12	4.33
I felt a sense of pride/ownership of the project.	43	4.30	16	4.38	12	4.08
The project felt authentic/"real world." (r)	44	3.89	16	4.25	12	4.08
There was enough interaction with client during the project. (r)	44	2.59	16	2.88	12	3.17

Table 2. Summary of students/alumni perceptions of their participation in each type of client-facing project. Each question was rated on a 1-5 scale where 1=Strongly Disagree and 5=Strongly Agree. Questions marked with (r) were negatively phrased on the questionnaire and have been reverse scored to aid interpretation.

participants also identified specific lessons, such as how to use and apply UX methods in a real-world setting, how to identify and overcome individual weaknesses, and how to identify an organization's key stakeholders. One participant summarized these lessons as follows:

"The fact that we had so little time to work for a client really forced me to learn how to manage the 'mess' of real world circumstances…I now feel more confident that I can tackle a messy project in a short period of time, while still completing quality deliverables."

Finally, respondents who participated in an extracurricular project cited two major takeaways from their experience. First, respondents stressed the value of gaining hands-on experience working in a client-driven environment, which taught them the importance of communicating the value of their work, managing client expectations, and effectively responding to client feedback. Second, respondents cited the general benefits of learning to apply UX methods and techniques in a practical setting. These lessons were best encapsulated by one participant, who stated:

"[The project] provided invaluable early exposure to the stakeholder/client relationship and to communication strategy issues within project development, concepts that are critical in a professional environment but are often hard to fully grasp in a classroom setting."

Overall Perceptions

Finally, respondents were asked to consider the overall impact of their participation in client-facing projects as part of their education (see Table 3). Overall, respondents had positive perceptions of their project experience, with most indicating that they were able to apply what they learned in other academic or professional contexts (mean = 4.45). Furthermore, most respondents felt more prepared for employment in the UX field as a result of participating in a client-facing project (mean = 4.16) and that their experience made them more marketable to employers (mean = 4.25).

Question	All Responses (n = 59)	
	n	*Mean*
I have applied what I learned from a client-facing UX project(s) in other coursework or in my professional work.	58	4.45
After participating in a client-facing UX project(s), I feel more prepared for employment in the UX field.	57	4.16
My participation in a client-facing UX project(s) has made me more marketable to employers.	56	4.25

Table 3. Students/alumni overall perceptions of client-facing project experiences. Question were rated on a 1-5 scale where 1=Strongly Disagree and 5=Strongly Agree.

Additionally, seven respondents said they received a job offer or secured an internship as a direct result of their participation in a client-facing UX project.

Several respondents also chose to leave open-ended feedback about their overall experience. In analyzing these responses, several prominent themes emerged. The most common theme expressed by participants was the value of including their client-facing project experience to build their portfolio. Many respondents shared the sentiment that participating in a client-facing project was "one of the best parts of [their] graduate school experience," with one participant stating that "the client-facing UX project is on par with an internship, as far as making real world connections and gaining practical experience." In addition to helping students build their portfolio, respondents also noted how their project experience made them more confident in their ability to actually complete UX work in a practical environment. As one participant explained:

"Working with a client…exposes the 'messiness' of working as an actual UX designer. Knowing how a UX study works and actually completing a UX study are inherently different."

Other respondents reported that their employers valued their client-facing experience, and others noted that they had been able to successful apply the skills they learned in other projects. Not surprisingly, many respondents explicitly requested more client interaction, particularly at the conclusion of the project. For example, one respondent wanted a final debrief session with the client "to see what was learned, what worked/didn't, and talk about…key results from doing the studies: we reduced errors by X, we drove increased revenue by X, whatever the key metric for the projects." This type of interaction is obviously beneficial, but may not always be possible given the finite timelines associated with client-facing projects completed in an educational setting. Nevertheless, we are exploring strategies for increasing student-client engagement on all types of projects, with a particular focus on finding effective and scalable ways to determine the long-term impacts of student contributions.

RESULTS: CLIENTS

The client survey received 14 complete responses out of a possible 23, resulting in a 63.6% response rate. Respondents included 3 clients (out of 5 valid contacts) who participated in an extracurricular project, 2 clients (out of 2 valid contacts) who participated in a course-long project, and 9 clients (out of 15 valid contacts) who participated in a course-embedded project. Thus, we are confident that respondents to the client survey are representative of the target population.

Results from the client survey are presented in three parts: perceptions of the client experience, impact of the students' contributions, and willingness to participate again.

Perceptions of the Client Experience

In addition to ensuring client-facing projects are impactful and valuable for students, the continuation of these project opportunities is also dependent on the quality of the experience for clients. Three dimensions of the client experience were considered: match between student work and client expectations, clients' assessment of their involvement in the project, and client's overall satisfaction with the work students provided. Results for these three areas are presented in Tables 4, 5, and 6.

Respondents indicated that students met or exceeded their expectations in the quality of their work products or deliverables, the depth of the work they conducted, and the creativity of the ideas/solutions provided. All but one respondent indicated the usefulness of the students' ideas/solutions met or exceeded their expectations.

In terms of client involvement, the majority of respondents said the amount or level of input on project outcomes, interaction with the project team, interaction with the faculty, and time they needed to commit to the project was "just right." However, echoing student concerns, three respondents said they did not have enough input on project outcomes and three said they did not have enough interaction with the student team.

Finally, the vast majority of respondents were satisfied or very satisfied with the professionalism of the student team, the manner in which work products were delivered, and the appropriateness of the ideas/solutions provided.

Overall, these results suggest that the clients are generally satisfied with the project, though additional student-client interactions would be welcomed.

Impact of Students' Contributions

In addition to being satisfied with the experience of being a client, it's also important to consider the ultimate impact of the students' contributions to the client organization. To that end, almost all of the client respondents (12 of 14) said their organization had either already used or had plans to use some of the ideas or solutions provided by the students. Specifically, five respondents said they had already made changes to their website based on the students' recommendations, four respondents had concrete plans to implement the students' ideas pending leadership approval and/or additional funding, and one respondent opted to discontinue their start-up project based on the students' feedback. The remaining two respondents who said they used or planned to use students' ideas did not provide further details. Of the two respondents did not plan to use the students' ideas, one respondent indicated that the ideas were too costly to implement while the other stated that the feedback was not sufficiently actionable.

Clients were also asked to describe the benefits, if any, their organization received as a result of their participation, and four themes emerged from the responses. First, respondents mentioned the improved quality of their product or service

Expectations:	**Below**	**Met**	**Exceeded**
Quality of the work products or deliverables	0 -	5 (35.7%)	9 (64.3%)
Depth of the work conducted	0 -	5 (35.7%)	9 (64.3%)
Usefulness of ideas/solutions provided	1 (7.1%)	4 (28.6%)	9 (64.3%)
Creativity of ideas/solutions provided	0 -	6 (46.2%)	7 (53.8%)

Table 4. Client expectations of student work.

Level/Amount of:	**Not Enough**	**Just Right**	**Too Much**
Input on project outcomes	3 (21.4%)	11 (78.6%)	0 -
Interaction with student team	3 (21.4%)	11 (78.6%)	0 -
Interaction with faculty	1 (7.7%)	12 (92.3%)	0 -
Time you needed to commit to the project	1 (7.1%)	13 (92.9%)	0 -

Table 5. Client assessment of their involvement.

Satisfaction with:	**Dissatisfied**	**Neutral**	**Satisfied**
Professionalism of student team	0 -	0 -	14 (100%)
The manner in which work products were delivered	0 -	1 (7.1%)	13 (92.9%)
The appropriateness of the ideas/solutions provided	0 -	2 (14.3%)	12 (85.7%)

Table 6. Client satisfaction with student work.

based on implementing students' recommendations. Second, respondents indicated that the students' work helped them set strategic priorities, mainly by providing "ideas [that] hadn't occurred to anyone else before." Third, respondents cited the benefit of seeing the UX process modeled by the student team, noting the value of not just the students' ideas but also "their observations, methodology and insights." Finally, several respondents cited some general benefits from participating, such as getting tips to improve their "on-boarding" process or "confirmation of their hunch."

Willingness to Participate Again

Finally, as perhaps the ultimate measure of satisfaction, all 14 client respondents said they would participate in a student project again.

When asked to explain why they would participate in another student project, respondents cited three primary reasons. First, respondents cited the value of their previous experience as a reason to come back, both because they found it enjoyable (e.g., two clients used the phrase "very fun for us") and because they found the students' ideas to be useful and relevant. Second, respondents cited student projects as a means to ensure they regularly conduct UX projects, observing that "UX is something we should be doing constantly to make [our organization] better." Third, respondents explained how working with students was an effective way to "get the fresh eyes on problems" and bring to the organization "skills sets we don't have."

Finally, although all respondents said they would participate in another student project, three respondents identified specific things they would change if given an opportunity to participate again: one respondent wanted the project to be more focused, one said they would benefit from more project updates and to offer input/feedback during the project, and another wished they had opportunities to challenge students on their observations.

RESULTS: INSTRUCTOR

The resents presented in the previous two sections indicate that the client-facing project opportunities at Pratt Institute have been useful and valuable experiences for both student and client participants. However, a third perspective is necessary to provide a complete picture of the program's long-term effectiveness and sustainability: the instructor's. To do so, we offer four insights and observations to help instructors incorporate client-facing projects into the UX curriculum. These insights extend similar lessons identified from previous studies and were derived from critical reflections and observations from the first author, who was responsible for leading and organizing all of the project opportunities described in this paper.

First, offering multiple models of client-facing project experiences is a sustainable and flexible way to provide opportunities for students to gain practical UX experience. Extracurricular projects are the closest simulation to the "agency model" of professional UX practice, but finding, organizing, and leading these types of projects is incredibly time-consuming, especially during the academic year. The results of this study show that course-embedded and course-long projects are valuable models for incorporating client-facing projects into the curriculum; in fact, these models were developed because the instructor realized that it would not be feasible to engage in extracurricular projects on a regular basis. With a variety of other project models available, instructors can be more selective about extracurricular projects and only accept them if they are a unique opportunity (i.e., a high-profile client).

Second, instructors should take the lead on recruiting clients for student projects because they have the knowledge to properly explain the value of client participation and the authority to set expectations and timelines (Lasserre, 2011; Mankoff, 2006). While client recruitment can be time-consuming, instructors can use a variety of strategies to ease the process. For example, instructors should establish relationships with local professional associations to assist with outreach to potential clients. In addition, instructors should target their outreach efforts to specific communities that may not be able to afford UX assistance and are more amenable to working with students (e.g., start-ups, cultural heritage organizations, non-profits, and small businesses). Importantly, client recruitment becomes easier as more projects are completed because past client participants can serve as valuable sources of referrals and past student participants (once they graduate) can recommend that their employers serve as clients. To aid with this process, the instructor should make an effort to document and publicize completed projects either through the institution's website or the instructor's personal website (Ritter, 2014).

Third, it is critical to clearly define client expectations prior to beginning a client-facing project, regardless of format. To help with this process, the instructor should develop a client orientation protocol that sets forth the overall expectations and outcomes for a project and pre-schedules specific client-student interactions based on expected project timelines and milestones (Lazar, 2011). Following this protocol allows the instructor to confirm that a client has a real and solvable need that can be realistically met by the student project while also ensuring that clients have appropriate expectations about their involvement and the project's outcomes. As recommended by (Lazar, 2011), it is helpful to formalize this protocol through a simple contract or memorandum of understanding.

Fourth, balancing the dual roles of educator and project manager is a learned skill that is developed through experience (Ritter, 2014). Incorporating client-facing projects into the classroom necessarily changes the role of the instructor by combining educational and leadership responsibilities; what Shneiderman may consider a merging of the "sage on the stage" and "guide on the side" roles (Shneiderman, 1998). The instructor must not only define the student learning outcomes at the outset of the project and provide instruction about specific methods or tools that students will use, they must also set timelines, provide feedback on deliverables, and ensure students are making sufficient progress toward project goals. Further, educators also need to scaffold projects so that students are fully prepared to succeed at each stage (Lasserre, 2011; Lazar, 2011). For course-embedded projects, it may mean scheduling the project to begin later in the course after students have gained sufficient knowledge; for course-long projects, it may mean establishing pre-requisites or other requirements to ensure students have sufficient experience prior to entering the course; for extracurricular projects, it may mean selecting students with a complementary mix of skills and experience.

CONCLUSION AND FUTURE WORK

This paper described and assessed one institution's efforts to integrate authentic client-facing projects into a graduate-level UX curriculum using three unique project types: course-embedded projects, course-long projects, and extracurricular projects. Through analysis of survey data from 59 students/alumni and 14 clients served over the past four academic years, we found that the overwhelming majority of students/alumni and clients found their project experience to be positive and impactful. Specifically, students/alumni said their participation increased their knowledge of UX concepts, their ability to create quality deliverables and interact with clients, their ability to work within the "messiness" of real world projects, and their confidence in applying UX methods. While some students wished for more opportunities for self-reflection and more client interaction, they generally felt their project offered a valuable opportunity to put their knowledge into practice and build a strong portfolio. Likewise, a majority of clients expressed high levels of satisfaction with their involvement and with the performance and professionalism of the student team, indicated that project work met or exceeded their expectations, and said they had already used or planned to use some of the ideas or solutions provided by the students. Furthermore, all client respondents said they would participate in a student project again. We also offered four insights about implementing client-facing projects into UX courses: (1) offer multiple project models to increase flexibility and sustainability; (2) have instructors take the lead on identifying clients to leverage existing relationships and target specific communities; (3) establish a formal protocol for establishing client expectations; and (4) develop skills in project management and scaffold projects to help students succeed.

Of course, a key limitation of this study was its exclusive focus on a single program within a graduate school of library and information science located in a major urban center and with courses offered exclusively in a face-to-face format. Thus, these results may not generalize to other disciplines (e.g., design or computer science), other levels (e.g., undergraduate), other formats (e.g., online), or other locations (e.g., non-urban). Future research efforts in this area will explore the role of client-facing projects in a broader array of educational contexts, with the ultimate goal of developing a more universal set of best practices and guidelines for implementing client-facing projects in UX education programs. A secondary goal, currently in progress, is evaluating approaches for enhancing student learning through self-reflection and enhancing feelings of "authenticity" by requiring more student-client interaction.

Despite this limitation, an important takeaway from this research is that although implementing client-facing projects can be time-consuming, they offer immense value to all involved stakeholders. As shown in this paper, students had universally positive feedback about their experience and many actually wished they could participate in *more* client-facing projects. Likewise, clients praised the students for providing valuable insights they would not have gotten otherwise and all said they would participate again. Finally, organizing and leading students through client-facing projects can be challenging for the instructor, but they are also a personally and professionally fulfilling experience (Ritter, 2014). From the educational value of watching students successfully apply concepts learned in the classroom to the practical value of helping an organization improve a product or service, client-facing projects offer educators unique opportunities to both observe and contribute to the real-world impact of UX practice. With that said, although some students/alumni indicated that they received a job or internship because of their client-facing experience and others said their experience was valued by their employers, only a small fraction of the student participants were interested in pursuing full-time UX careers. While these early results are promising, further work is needed to assess whether and to what extent these types of projects can truly help students overcome the UX "experience gap" on a consistent basis and on a wider scale.

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