Advancing UX Education: A Model for Integrated Studio Pedagogy

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ABSTRACT
The rapid growth of the UX profession has led to an increased need for qualified practitioners and a proliferation of UX educational programs offered in both academia and industry. In this note, we present the design and initial evaluation of a new studio-based undergraduate program in UX—the first of its kind at a large, research-intensive US university. The program includes several curricular innovations, such as an integrated studio pedagogy in which six topical strands are interwoven across two types of studios. These studios are interconnected and span five semesters of the undergraduate experience. We present the curriculum model and the foundational principles that informed its design. We describe the two types of studios and their interconnection, and present early evaluation data showing that students are building valuable skills. The program described in this note provides a trailblazing model for UX pedagogy at the undergraduate level.

Author Keywords
HCI pedagogy; UX competence; studio education.

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION
The UX profession has experienced rapid growth in recent years, with numerous reports indicating that designers with UX skills are in high demand [1,6,7,34]. For example, in 2015, CNN Money ranked UX designer as the 14th best job in the USA according to levels of growth, pay, and satisfaction [7]—up from the 43rd spot in 2012 [6]. Given the growth of the UX profession, and the increasing demand for qualified professionals, it is important to consider the need for undergraduate UX education.

Early recommendations by SIGCHI suggested that HCI education be kept at the graduate level due to a lack of disciplinary stability [10]. However, some undergraduate programs related to HCI (i.e., UX) have appeared in recent years, primarily in art and design schools [e.g., 4,19,34]. These degree programs complement the multitude of non-academic opportunities for UX education such as those facilitated by General Assembly [24], or certificates offered by both universities and industry organizations [1,34].

The growth of both the profession and UX education makes UX pedagogy a relevant topic for discussion and research. In this note, we describe an integrated studio model for undergraduate UX education. The contribution of this work is twofold: 1) it increases awareness of how HCI scholarship is translated to practice within an undergraduate UX learning experience, laying the groundwork for future research on UX pedagogy; 2) it demonstrates how an integrated studio approach at the undergraduate level activates third-paradigm HCI concerns through learning-by-doing, preparing students for current and future challenges on both technical and critical dimensions of practice.

RELATED WORK
Little scholarship addresses HCI pedagogy in a formal or direct way, and similarly scarce research guides the creation of formal curricula in UX and other emerging areas of HCI practice. Early efforts to consolidate HCI curricula can be found in a 1992 SIGCHI Curriculum Development group report [18], which recommended a range of specific outcomes for graduate education, while discouraging the creation of undergraduate programs due to the lack of disciplinary stability in HCI at the time. In 1992, the major concerns were the "changing nature of the professional role" and the "nature of [HCI] disciplinary knowledge," with the recommendation to embed HCI within existing disciplinary curricula [18, p.56].

However, a recent report from the SIGCHI Education Project, led by Churchill, Bowser, and Preece [5], has brought renewed attention to HCI pedagogy. While their discussion of HCI education is relatively general, blurring boundaries among interaction design, user experience, and other common strands of practice, this report details concerns and challenges regarding the structure and core knowledge of HCI education. There is a constant tension between keeping curricula current and detailing the types of content and experiences that undergraduate and graduate programs in HCI should include [5,10]. The methods,

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Competency Area	Description
Visual & Interactive Representation	Visual and interaction design principles, encompassing the planning, creation, evaluation, and communication of artifacts and design decisions.
Social/Research Methods	Skills in data collection, analysis, and evaluation that span multiple disciplinary perspectives, including qualitative and quantitative approaches.
Design Philosophy	Multiple paradigms of and approaches to design, including the impact of this complexity on a student's development of a personal and independent design identity.
Technical Skill	Development skills related to creating working prototypes, including specific software tools, scripting languages, and physical construction approaches.
Leadership/Teamwork	Project management, entrepreneurship, and professional communication skills.
Global Consciousness	Collaboration skills for a global economy, spanning cultures, time zones, and work contexts.

Table 1. Program-level competency strands.

topics, and subjects mentioned by survey respondents in [5] are truly diverse, paralleling Faiola's [10] call for a broad set of educational focus areas spanning social science, design, business, and computing.

The majority of extant UX pedagogical research relates to the integration of innovative learning approaches, such as studio or critique [1,15,27]. Studio pedagogy refers to a set of practices, largely drawn from art and design education, that encourage the development of expertise through learning-by-doing and reflection on these activities through a formative feedback mechanism known as *critique* [3,20,30,31]. The integration of studio approaches such as critique and constructionist-oriented learning in UX pedagogy have built on third-paradigm approaches to HCI scholarship that bring increased focus on design and criticality. The third paradigm allows a focus on criteria beyond usability and efficiency, addressing the value-laden nature of design activity in HCI [17]. Within this framing, scholars have offered specific approaches to engage the development of design and technical ability [1,10,12,15,36] as well a value-centered approach that incorporates critical dimensions of third-paradigm HCI scholarship [21,33].

Practitioner Expectations of UX Competence

Another important thread of scholarship relevant to UX pedagogy is practitioner self-learning, including the means by which practitioners remain competent over time. Recent studies underscore the importance of understanding HCI practice on its own terms [32], and descriptive studies have outlined important areas of competence that relate not only to technical skill, but also communication and other "soft skills" [13,14,26]. Studies of UX competence [e.g., 13,14] have revealed a range of such skills that are relevant to practice, such as communication, lifelong learning, non-technical representational knowledge, and leadership skills.

INTEGRATED STUDIO PEDAGOGY

The core of the UX pedagogy model we have implemented consists of two types of integrated, interconnected studios. Together, the studios and related areas of coursework support students in achieving mastery in six thematic strands: visual and interaction representation; social/research methods; global conscience; design philosophy; technical skills; leadership/teamwork (Table 1).

The six strands are integrated across the curriculum. One studio experience may include four or more of these strands, resulting in an *integrated studio approach*. This integrated model of studio encourages the development of multiple skills and knowledge simultaneously, in an environment that is grounded in the complexity and reality of UX practice. Integration is achieved through two types of interconnected studios that span five semesters of the students' undergraduate careers. It is further supported by course requirements in related areas that include: psychology, communication, leadership, and global consciousness. The student experience culminates in a year-long capstone project. The following sections provide an overview of the two types of studios and discuss the foundational principles that informed the development of this UX curriculum.

UX Studios

There are two types of studios in our curriculum, which we refer to as Learning Studios (LS) and Experience Studios (ES). Learning Studios are cohort-specific and provide an integrated approach to teaching fundamental and specialized UX skills, while Experience Studios engage multiple levels of students on client projects in an agency-like environment.

Learning Studios (LS)

LS are cohort-specific studios where instruction is structured according to specific learning outcomes. The learning outcomes increase in complexity across five consecutive semesters, with a focus in each semester on the following areas of UX practice: data collection, data analysis, prototyping, evaluation and testing, and theory and history of HCI and design. Students work on team projects and individual exercises, regularly engaging in group critique, peer critique, and reflection as means of formative assessment [29,31]. The projects and assignments are carefully engineered by the teaching team to support student achievement of specific learning outcomes and objectives in an environment that represents a heightened

version of practice, where deadlines and constraints intentionally encourage specific types of development. Projects range in duration from two weeks to a full semester, with each experience including primary and secondary data gathering, analysis, problem framing, prototyping, testing, and documentation.

While all LS address user-centered design approaches, methods, and techniques, they differ in complexity and application area. For example, LS1 offers an introduction to the fundamentals of UX and human-centered design, focusing on paper-based deliverables such as sketches and paper prototypes. LS2 is screen-based, adding elements such as visual and interactive design principles, web programming, and high fidelity prototyping. LS3 expands the design space to include physical means of prototyping, and introduction to omni-channel UX. LS4 addresses the integration of UX into business contexts, including concepts such as strategic design and lean UX. Finally, LS5 enables students to continue developing a specific specialization in an aspect of UX, which can also be substituted for an internship experience.

Experience Studios (ES)

As opposed to LS, which are tightly structured around increasingly complex levels of learning outcomes, ES are intended to be a *managed chaos* where the learning is embedded within the experience of doing actual UX work [22]. In ES, students of various levels work together in a diverse team on projects originating from external client sponsors. While LS projects and assignments are written by the teaching team, ES projects and deliverables are specified by the client. Industry, community, and/or university-based partners provide project submissions that specify a problem to be solved. Students apply the skills acquired in LS to solve problems in a real-world consultancy-based experience, acquiring new skills as needed in order to accomplish required tasks, work effectively in a team, and engage in professional communication and project management.

ES learning outcomes of professional communication, project management, teamwork, and UX specialization increase in difficulty across the three levels of ES. For example, teamwork can be assessed differently within one student team, depending on each student's level. Whereas freshmen enrolled in ES1 aim to participate and contribute to teamwork activities, sophomores enrolled in ES2 are expected to be accountable for team activities, and juniors enrolled in ES3 will create and manage team resources and activities. This self-managing team model creates a UX learning community where students engage in peer critique, share knowledge, openly discuss issues, and collaboratively use critical thinking skills to create solutions. [9] The instructor's role is to monitor and coordinate student teams and offer individual guidance as needed. Every team provides weekly updates that are presented and discussed in small peer critique groups that mimic a typical industry environment. The students build metacognitive awareness of their development by engaging in these peer critique opportunities [25], while also the instructor to monitor project management and teamwork goals.

LS and ES are tightly integrated. Their integration, as well as the pedagogical principles that inform the entire curriculum, are explained next.

Foundational Pedagogical Principles

Our UX pedagogy model is informed by a series of foundational pedagogical principles grounded in the studio model of instruction [30,31]: integration, in-context learning, real-world experience, mentorship, multidisciplinarity, and individualized learning.

Integration refers to the integration of several thematic strands at both the curriculum and the course level, and the relationship between the two types of studios. Integration also impacts our approach to *learning in context*, where problem- and project-based learning experiences are used to stimulate connections among concepts and their appropriate application. We apply integration and learning in context within each studio by including multiple areas of UX in each course. For example, students do not take separate courses in research methods or graphic design. Instead, we avoid this artificial separation of topics into courses and instead create holistic learning experiences that require students to engage in multiple aspects of UX work simultaneously. This approach is meant to help students integrate multiple aspects of UX into a comprehensive mental schema. Moreover, it overcomes the transferability problem of traditional approaches to curriculum design, where students often have difficulty making connections among various courses.

Real world experience is ensured through authentic projects in LS and projects sponsored by external clients in ES. Working on client projects ensures that students gain supervised external work experience and are exposed to situations that would not occur otherwise in a classroom. Skills in client communication, professionalism, and UX advocacy are critical for professional success, yet many students are under-prepared in these areas in a traditional undergraduate curriculum [14]. By providing authentic learning experiences, we create opportunities for regular reflection, critique, and mentorship.

Mentorship is integrated at multiple levels through program-wide assignment of peer and faculty mentors. In ES studios, the instructor's function is primarily in a mentoring role, in tandem with student mentorship at multiple levels where advanced students are expected to mentor beginners. Research shows that peer mentorship has numerous benefits, including improving retention rates, fostering a sense of community, building academic and social skills, and increasing learning outcomes [8,28].

By its very nature, UX is a field that draws upon and connects across multiple disciplines. Thus, taking a

multidisciplinary approach to learning is critical to prepare students for success in their future profession. We integrate multidisciplinarity in studios through team teaching where possible, ensuring that different disciplines (e.g., graphic design, psychology, communication, computer science) are integrated in each studio. Moreover, related areas of coursework are designed to provide students with sufficient background in other disciplines. The related areas emphasize psychology, so that students understand the rationale behind many usability principles, enabling them to create and evaluate solutions with human perception, attention, cognition, and emotion in mind. Technical electives are a second related area that ensures students are conversant in major programming languages, and are able to develop what they imagine. Communication is a related area, not only because of its importance at the interface level, but also because documenting and presenting UX work is a necessary skill. Related areas also include global consciousness and leadership, in addition to free electives.

The last foundational principle is *individualized learning*, and it is directly related to mentorship. Through mentorship and flexible instructional methods, we encourage each student to specialize and pursue her interests. Specialization is supported by choice of courses in related areas, roles on team projects, and a tailored final experience intended to build deep specialized skill in user research, screen-based design, physical computing, or UI design in LS5.

Initial Evaluation

We conducted an initial evaluation of the first semester of the new undergraduate program as a means of quality assurance and alignment across the two studio experiences. Students (n=17; most enrolled in both studios) self-reported their perceived abilities on a seven-point scale. Questions included: defining human-centered design, collecting data from users, finding appropriate problems to solve, defending solutions to stakeholders, and creating compelling prototypes.

	Pre Mean (SD)	Post Mean (SD)
Define design	3.41 (0.93)	5.76 (0.64)
Collect data	3.47 (1.50)	5.76 (0.64)
Frame problems	4.06 (1.39)	5.22 (0.53)
Defend decisions	3.35 (1.33)	5.41 (0.97)
Create prototypes	3.70 (1.52)	5.71 (0.74)

Table 2. Pre/post student survey results.

On all five dimensions, a paired t-test ($df=16$; $p < 0.01$) revealed a significant difference from start to end of LS1.

In addition to the quantitative assessment of learning progress, student reflections and course evaluations also provide insight into the learning experience of the program:

> *"We not only read about theories and methods but we put them to action in the classroom. He gave us a lot of opportunity to use our creative abilities. I also liked how he pushed us getting to know each other and getting comfortable with each other. It made a huge difference when the projects progressed."*

> *"With my experience studio project at [external sponsor], my team has been able to spread what I like to call "The Human Centered Design Manifesto" to many people in a company that is traditionally not equipped or interested in pursuing such endeavors."*

> *"The studio experience really shocked me. I have never been in a course that was so tasking, yet so enjoyable at the same time. It was kind of amazing how excited I was about the content that I was learning and the work I was getting to do day in and day out. That excitement really made the course easier to enjoy and increased my dedication and effort in everything that I did throughout the semester."*

These reflections indicate that students quickly internalize key aspects of UX design and understand the importance of the foundational pedagogical principles. While there are limitations to this initial self-reported course evaluation [11], we expect to see increased gains through multiple measures as students take additional studios and build individual areas of specialization.

FUTURE WORK

Our description of this undergraduate UX program facilitates a broader conversation regarding the state of UX pedagogy in higher education, particularly in a North American context. While many practitioners currently employed in UX or other HCI roles do so without formal training in the discipline [23], the demands of industry require a more substantial focus on educating students explicitly for these careers. This requires the CHI community to invest in the scholarship of teaching and learning as it relates to core HCI knowledge, including identification of pedagogical approaches and curricular models that encompass the broad space of UX, interaction design, and service design practice. While this note is focused on the program level, we also see value in exploring specific course experiences and outcomes in greater detail.

CONCLUSION

In this note, we outlined a model for UX pedagogy, detailing the role of an integrated studio approach in building deep technical and professional competence. This curriculum design lays out a space for research on HCI pedagogy at CHI, expanding on the relevance of translating aspects of core HCI knowledge to learning and practice. This research space ideally ties together recent interests in understanding practice on its own terms [e.g., 13,23,26,32], suggesting that there is substantial benefit in understanding how UX knowledge is created and disseminated within HCI scholarship and practice [16,26], and how this knowledge is acquired via formal and informal means [14].

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