

The Computer Science Professionals Hatchery

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Purpose

The Computer Science Professionals Hatchery seeks to transform undergraduate education by replicating the best elements of a software company environment, layering in moral, ethical, and social threads with entrepreneurship and professional skills. The Computer Science Professionals Hatchery focuses on three curricular innovations: (1) VERTICAL INTEGRATION. Instead of being siloed, students at all grade levels will work with and learn from each other on industry-sponsored projects, fostering a strong sense of community amongst students, faculty, and industry. (2) Short, narrowly focused HATCHERY UNITS will complement regular course work by presenting aspects of specific foundational concepts or skills, which cut across the curriculum using a unique approach that overlays agile Hatchery Units with regular courses. To ensure that these courses focus on professional formation, we directly involve industry partners in the design of these courses, and in some cases include industry partners on the instructional team as well. (3) ETHICS AND SOCIAL JUSTICE will be incorporated across the curriculum to encourage students' development as professionals, and empower them to be agents of change in reshaping computer science to be a more just and inclusive profession.

Theoretical framework

This project leverages three primary theoretical frameworks. Rogers' (2003) theory of diffusion of innovation guides our approach to creating lasting change in our department. Designing a vertically integrated curriculum that builds connections across grade levels is informed by Wenger's (1998) Communities of Practice as we build community through establishing norms and developed shared understanding. Our approach to incorporating ethics and social justice in the computer science curriculum is grounded in Rawls' (1999) theory of social justice.

Methods & data sources

This project utilizes a mixed methods approach to study the curricular and departmental modifications and their effects on student learning, faculty pedagogical approaches and attitudes, and cultural transformation. Qualitative data collected for this project will include interviews with all stakeholders (students, faculty, industry partners), along with ethnographic observations to assess the change in culture of the department. Also, we have conducted a needs assessment through meeting with local industry representatives to identify technical and professional skills best suited for Hatchery Unit courses. Quantitative data sources include course-level surveys, baseline and change-assessment surveys administered to all members of the department, and student records and demographic information.

Results & Scholarly significance

Through meetings with local industry representatives, we identified numerous technical and professional skills that are being addressed via the development of multiple 1 credit Hatchery Unit courses. A group of seventeen professionals representing a diverse set of local software development companies brainstormed and identified six categories of knowledge, skills, and abilities necessary for success: Business, Collaboration & Teams, Entrepreneurship, Professional Skills, Research & Development, and Technical Skills. In response to these needs, we received fourteen Hatchery Unit proposals that involved seventeen faculty and eight industry professionals to date (from a department of twenty-six faculty - represents a high degree of faculty involvement). After a follow up meeting with industry partners in October, the project team evaluated and ranked Hatchery Unit (HU) proposals using a rubric. Each HU team was required to have at least one industry professional. For AY 2017/18, Computer Science department offered the following Hatchery Unit courses: *Foundational Values*, *Navigating Computer Systems*, *Introduction to Version Control*, *Agile Development*, *Introduction to Database System Usage*, and *Technical Interviews, Jobs and Careers*.

The *Foundational Values* Hatchery Unit introduces freshmen/sophomore students to ethics and social justice and their relationship to computer science and software development and provides both a framework and tools for understanding these topics that can be threaded through the undergraduate curriculum. Students learn these topics via case examples grounded in contemporary examples of bias and discrimination in both software systems and the software development industry. Major deliverables for the course include successive development of analytic and synthesizing skills necessary to produce drafts of social contracts designed to actualize Rawls' (1999) theories of social justice and address specific issues of injustice both in the cases presented and in their own classroom.

Also, Hatchery Units present a unique opportunity for vertical integration by threading content through the curriculum as a means of both strengthening student understanding and building social relationships. For example, the HU units for *Agile Development* and *Database Usage* will be taught as co-requisites for a junior-level Data Structures course. The students will then use those concepts in a large team project at the end of the Data Structures course. This threading not only reinforces the skills for the students but also creates a stronger sense of community between instructors, and will help faculty become more familiar with the entirety of the undergraduate computer science curriculum. Another example is the threading of foundational values of social justice and ethics. This work is being accomplished by embedding the social science co-PI in all HU teams, thereby incorporating this content within all technical courses so those values are reflected widely in the HUs and the overall curriculum.

In addition to developing students who are better prepared to meet the needs of industry and be advocates for change in the computer science profession, the Computer Science Hatchery represents an innovative approach to creating an agile curriculum that is responsive to local and societal needs and serve as a model for other disciplines.

References

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Wenger, E. (1998). *Communities of practice: learning, meaning, and identity*. Cambridge, U.K. ; New York, N.Y: Cambridge University Press.