BOISE STATE UNIVERSITY

CS Hatchery

The Computer Science Professionals Hatchery

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*The **Computer Science Professionals (CSP) Hatchery** will create a revolutionary learning environment by modeling the best practices of a software company work experience, layering nurturing aspects that promote ethical questioning, value diversity, and a focus on professional skills such as increased collaboration, communication, and teamwork.*

Abstract

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 that cut across the curriculum, using a unique approach that overlays agile Hatchery Units with regular courses. (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

- **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 **Rawl's (1999) theory of social justice**.

Guiding Questions

1. How can ethics and social justice be incorporated into an undergraduate computer science curriculum?
2. How does the transformed curriculum influence students' undergraduate experience?
3. What are the barriers and supports to curricular change and beyond?

Objectives

Create a Culture of Engagement

- Develop faculty members who understand and are invested in the major elements of the curriculum across all 4 years.
- Build a strong sense of community amongst faculty, students, and industry partners, with stronger ties and working relationships between these constituencies.
- Overcome barriers and implement sustainable drivers for curricular innovation.

VITaL
Vertically Integrated Teaching and Learning

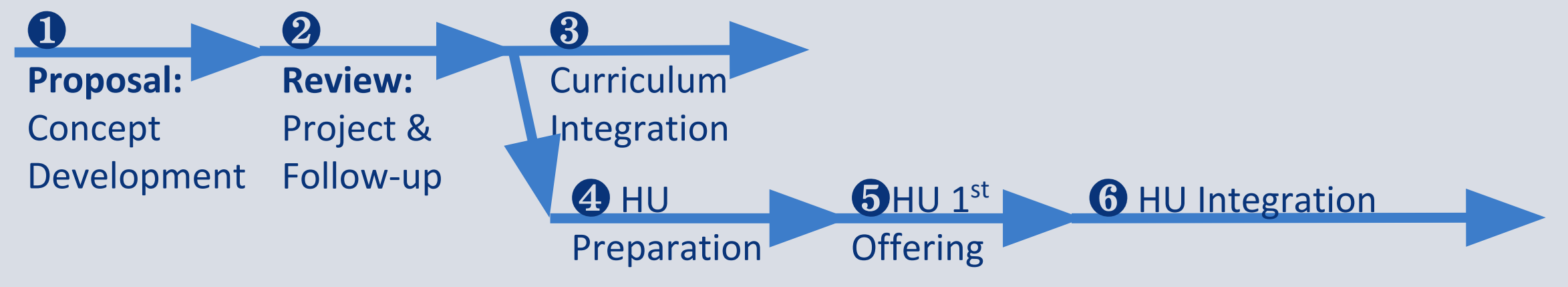
- Improve real-world relevance of the student educational experience, leading to improved student motivations and job preparation.
- Fuse professional and entrepreneurial skills learning throughout the curriculum that complements technical skills learning.

Create a Diversity-Promoting Revolution

- Implement a progressive introduction of best practices supporting diversity and ethical/moral professional practice to sensitize students.
- Develop and teach approaches for inseparably infusing ethical/moral elements into the practice of software engineering to train students as positive agents of change in their workplaces.

Hatchery Change Process

Hatchery Units (HUs) are one credit courses focused on skills relevant to computer science professionals and designed to rapidly adapt to the changing needs of industry. HUs are also a vehicle to diffuse social justice and equity through the curriculum.



Proposal

- Submission
- Project Review & Follow-up
- Industry Knowledge, Skills and Abilities (KSA) Evaluation
- *Concept Decision:*
  - Approve Development
  - Proposal Refinement
  - Defer Proposal

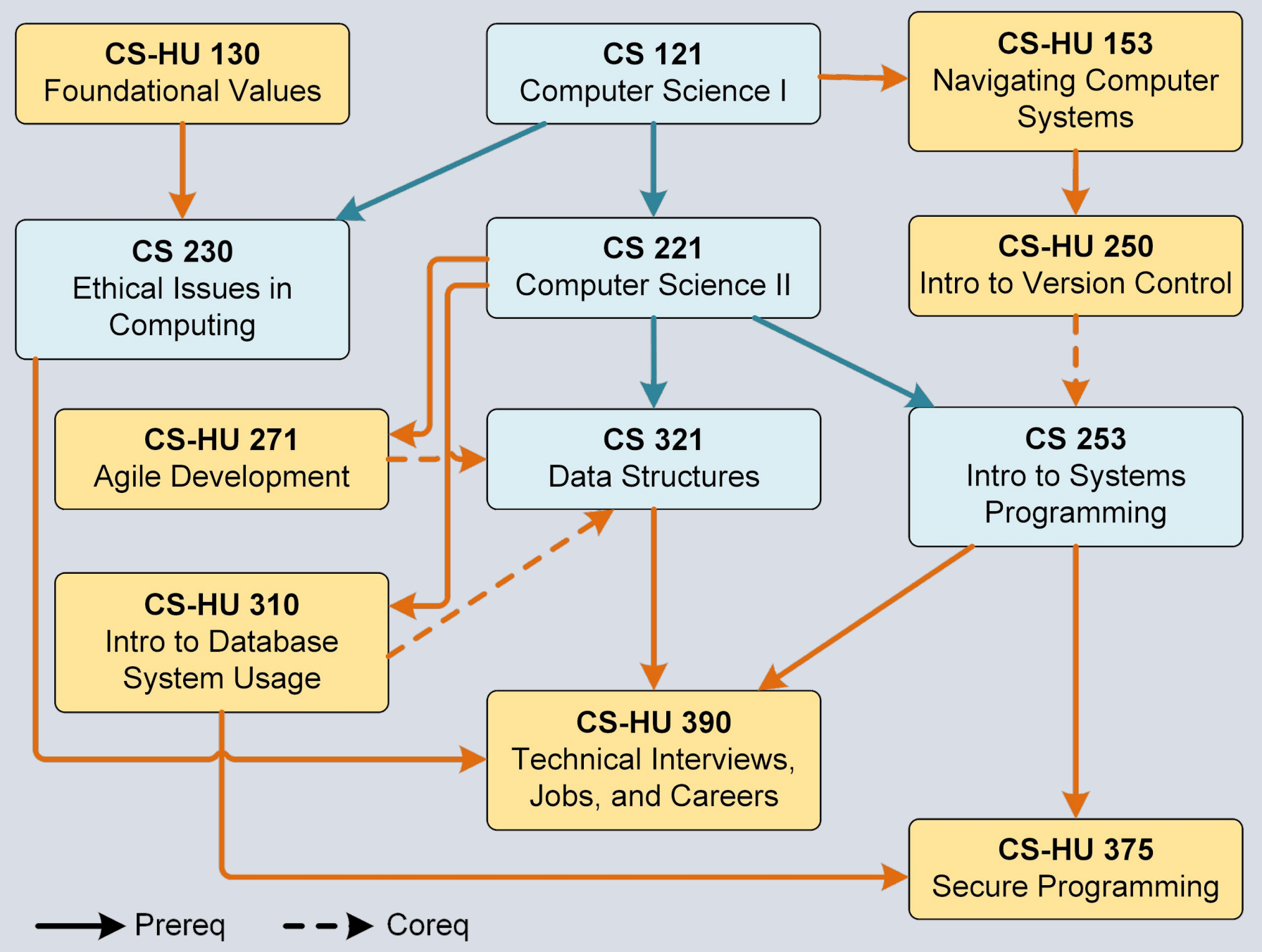
Development

- Syllabus
- Industry Participation
- Course Materials
- 1st Course Offering
- *Pilot Decision:*
  - Course Approval
  - Course Refinement
  - Defer Course Integration

Integration

- Course Refinement
- *Integration Opportunities:*
  - HU Content Threading
  - Capstone Integration

Hatchery Curriculum Map



Hatchery Units

Hatchery Course	Start	# Students Fa'17+Sp'18+Su'18
Foundational Values CS-HU 130	Fa'17	232
Agile Development CS-HU 271	Fa'17	52
Navigating Computer Systems CS-HU 153	Sp'18	136
Intro to Database System Usage CS-HU 310	Sp'18	42
Intro to Version Control CS-HU 250	Su'18	15
Technical Interviews, Jobs & Careers CS-HU 390	Fa'17	14
A Brief Intro to HCI CS-HU 269	Fa'18	--
Current Topics in Computer Science CS-HU 398	Fa'18	--
Software Testing CS-HU 274	Sp'19	--
Secure Programming CS-HU 375	Sp'19	--

Foundational Values HU

- Introduces freshmen/sophomore students to ethics and social justice and their relationship to computer science and software development
- Provides rubrics and frameworks for assessing team conduct in courses and in development teams, and for assessing and addressing issues of bias and discrimination in professional practice
- 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 experiences.

"...That's just the way the world is! If [under-represented groups] can't handle that, I can't help them..."

"What we have is not `the way it is,` it is the way we have allowed it to be."

"...every bit of computer science touches and affects society. We <u>have to be</u> careful what our tools do to people!..."

Progress

- 14 HU proposals submitted (2/3rd faculty participation)
- Approved 10 HU courses: 5 required, 5 elective
- RED team member on each HU team
- All CS faculty interviewed by social science PI
- Received 500+ student responses on beliefs, perceptions, educational experience, social (cultural competence) and emotional (self-esteem)
- Interviewed industry partners

Challenges

- Ingrained biases and comfort zones
- Building student and faculty buy-in and participation
- Logistics: scheduling, integration and threading, advising, communication
- New course development
- Modifying existing courses to utilize Hatchery concepts – *"Threading"*
- Increasing future survey response rate and willingness to provide feedback on beliefs and experiences
- Using survey and interview data to identify and address ongoing challenges

Next Steps

- **Threading HU content** in CS courses
- **Capstone integration**
- Add additional HU as necessary
- Establish an "Entrepreneurial Emphasis"
- Examine students' social/emotional levels
- Monitor HU content implementation
- Research, Validation, and Publication
- Final assessment of program impact

Industry Partners

hp clearwater MWI Animal Health AmerisourceBergen
cradlepoint WhiteCloud ANALYTICS AppDetex Brand Protection Technology Simplot
Micron IMPACTGROUP visitpay metageek

References

Rawls, J. (1999). *A Theory of Justice* (Rev. ed). Cambridge, Mass: Belknap Press of Harvard University Press.
Rogers, E. M. (2003). *Diffusion of innovations*. New York: Free Press.
Wenger, E. (1998). *Communities of practice: learning, meaning, and identity*. Cambridge, U.K.; New York, N.Y: Cambridge University Press.