**Computer Science Professionals Hatchery**

"Measures of Success"

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**Assessing Community in an Undergraduate Computer Science Program Using Social Network Analysis**

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### Products

<table>
<thead>
<tr>
<th>Conference</th>
<th>Year</th>
<th>Location</th>
<th>Type</th>
<th>Product Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASEE - American Society for Engineering Education</td>
<td>2017</td>
<td>Columbus, Ohio</td>
<td>Paper</td>
<td>Talking about a Revolution: Overview of NSF RED Projects</td>
<td>Dr. Noah Salzman (Co-PI) - Educational Specialist</td>
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<tr>
<td>USEERED: REV - Revolutionizing Engineering Departments</td>
<td>2017</td>
<td>Arlington, Virginia</td>
<td>Paper</td>
<td>Reforming the Next Generation of Computer Science Professionals</td>
<td>Dr. Amit Jain (PI) - CS Department Chair</td>
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<tr>
<td>SEEn - Frontiers in Education (FIE)</td>
<td>2017</td>
<td>Indianapolis, Indiana</td>
<td>Poster</td>
<td>Influencing Culture and Curriculum via Revolution</td>
<td>Dr. Don Winiecki</td>
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<tr>
<td>RESPECT - Research on Equity &amp; Sustained Participation in Engineering, Computing, &amp; Technology</td>
<td>2018</td>
<td>Baltimore, Maryland</td>
<td>Poster</td>
<td>Revolutionizing the Culture of Computer Science</td>
<td>Dr. Don Winiecki</td>
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<tr>
<td>CDNE2 - Collaborative Network for Engineering and Computing Diversity</td>
<td>2018</td>
<td>Crystal City, VA</td>
<td>Paper</td>
<td>The Computer Science Professionals' Hierarchy, at Boise State University: Incorporating Inclusion, Diversity, and Social Justice into the Computer Science Curriculum</td>
<td>Dr. Don Winiecki</td>
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<td>CQSE - Coalition for National Science Funding</td>
<td>2018</td>
<td>Washington, DC</td>
<td>Poster</td>
<td>Reforming the Next Generation of Computer Science Professionals</td>
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<tr>
<td>ASEE - American Society for Engineering Education</td>
<td>2018</td>
<td>Salt Lake City, UT</td>
<td>Paper</td>
<td>The Computer Science Professionals' Hierarchy</td>
<td>Dr. Don Winiecki</td>
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<tr>
<td>USEERED: REV - Revolutionizing Engineering Departments</td>
<td>2018</td>
<td>Alexandria, Virginia</td>
<td>Presentation</td>
<td>Portable concept lab unit</td>
<td>Dr. Don Winiecki</td>
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<tr>
<td>USEERED: REV - Revolutionizing Engineering Departments</td>
<td>2018</td>
<td>Alexandria, Virginia</td>
<td>Presentation</td>
<td>Incorporating Focused Professional Skills, and Inclusion, Diversity, and Social Justice into the Computer Science Curriculum</td>
<td>Dr. Don Winiecki</td>
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<tr>
<td>HCICS - Hawaii International Conference on System Sciences</td>
<td>2019</td>
<td>Macau, China</td>
<td>Paper</td>
<td>The Reality; An Agile and Effective Curricular Innovation for Transforming Undergraduate Education</td>
<td>Dr. Don Winiecki</td>
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<tr>
<td>RESECT - Research on Equity &amp; Sustained Participation in Engineering, Computing, &amp; Technology</td>
<td>2019</td>
<td>Minneapolis, MN</td>
<td>Paper</td>
<td>Teaching Professional Morality and Ethics in Undergraduate CS</td>
<td>Dr. Don Winiecki</td>
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<tr>
<td>PSA - Pacific Sociological Association</td>
<td>2019</td>
<td>Dalian, CN</td>
<td>Paper</td>
<td>Abstract</td>
<td>Dr. Don Winiecki</td>
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<tr>
<td>ASEE - American Society for Engineering Education</td>
<td>2019</td>
<td>Tampa, FL</td>
<td>Poster</td>
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### Highlights:

- Identify institutional practices and social dynamics that produce "super-connectors"
- Hypothesize that connected students are more likely to persist when they encounter setbacks or adversity
- Students in higher grade levels have more densely populated networks
- Significant connectedness variation, ranging from 1 to 28 connections
- Analyses of variations in connectedness can expose factors that could help explain lower completion rates
- Teaching assistants and tutors are typically well connected and important for building connections across grade levels

### Conclusions:

- No meaningful differences in the connectedness of male versus female students, white versus non-white students, or traditional versus non-traditional students
- Significant differences in the connectedness of several subgroups:
  - Students' connectedness increases through the four years
  - Students in their fifth year or more of studies tended to be less connected than traditional seniors
  - Students who identified themselves or their peers as gamers tended to have significantly more connections than their non-gaming classmates
- Quantitatively demonstrates the importance of teaching and learning assistants in creating community in the CS department
- These individuals have an outsized impact in building connections in the undergraduate CS community and further support the value of peer tutors
- Lack of connections for students can help to diagnose the overall feeling of 'non-belongingness' in CS
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.

**Entrepreneurial Partner for Success!**

**Moral Foundational Values**

**Technical Software Company Environment**

"Incubate Agents of Change"

**Professional Engagement**

**Social Business Mindset**

**Ethical Software Testing**

**Agile Development**

**Vertically Integrated Toaching and Learning**

**Engaged/Shared Learning**

**Ethical/Moral Infusion**

**Real-World Relevancy**

**Professional & Entrepreneurial Skills Complement Technical**

**Positive Agents of Change!**

**Next Steps**

- Additional HUs planned 2019-2020
- Continue faculty HU instructional rotation
- Continue "Threading" HU content in courses
- Evaluate "KSA content" in CS courses
- "Capstone integration" feasibility evaluation
- Examine students' social/emotional levels
- Research, Validation, and Publication
- Final assessment of program impact

**Progress**

- Approved 11 HU courses: 5 required, 6 elective
  - 5 delivered in 2017-2018, 3 in 2018-2019
  - 57 sections, 1,584 students (Fa'17-Sp'19)
- "Entrepreneurial Emphasis" approved for Fall 2019
- 14 faculty have taught a HU (9 grant members)
- 4 industry partners have taught a HU
- Faculty & industry partners - 2nd round interviews
- Student baseline and social network analysis
- 5 papers co-authored with other Universities
- Products to date: 15 conference presentations/papers, 1 book, and 3 websites

**Challenges**

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

**Knowledge, Skills, & Abilities**

Through several meetings with industry representatives, we iteratively developed the KSA categories and desired outcomes shown below.

<table>
<thead>
<tr>
<th>KSA Category</th>
<th>Desired Outcomes</th>
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<tbody>
<tr>
<td>Business</td>
<td>Understanding how a company makes money and executes strategy</td>
</tr>
<tr>
<td>Collaboration &amp; Teams</td>
<td>Working with people and groups to achieve a goal</td>
</tr>
<tr>
<td>Entrepreneurship</td>
<td>Organizes, manages, and assumes risks of a business or enterprise</td>
</tr>
<tr>
<td>Professional</td>
<td>A person engaged and qualified in the computing profession</td>
</tr>
<tr>
<td>Research &amp; Development</td>
<td>Seeks innovation and improvement of products and processes</td>
</tr>
<tr>
<td>Technical</td>
<td>Practical knowledge and skills associated with the computing field</td>
</tr>
</tbody>
</table>

**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.

1. **Proposal**
   - Submit Proposal
   - Validate Project & Follow-up
   - Develop Proposal
   - Pilot Decision:
     - Defer Proposal
     - Approve Development
     - Defer Proposal

2. **Integration & Development**
   - Industry Participation
   - Subject Matter Experts
   - 1st Course Offering
   - Pilot Bubbles
   - Course Approval
   - Course Refinement
   - Defer Course Integration

3. **Course Offering & Review**
   - Syllabus
   - Industry Participation
   - Subject Matter Experts
   - 1st Course Offering
   - Pilot Bubbles
   - Course Approval
   - Course Refinement
   - Defer Course Integration

**Hatchery Curriculum Map**

- Foundational Values
- Engraged/Shared Learning
- Threading Freshman to Senior Courses

**Revised: May 2019**