Using Research-Practitioner Partnership (RPP) to Implement Computer Science Education in K-12

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Panel as Planned

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Today’s panel

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Our NSF CSforALL RPP Projects

Next Door to Silicon Valley: An RPP to Address Disparities in Access and Expectations for Computer Science Education & A Coordinated, Cross-Institutional Career and Technical Education Cybersecurity Pathway

CONECTAR: Collaborative Network of Educators for Computational Thinking for All Research

CSP4Hawaii: Deployment of Computer Science Principles Courses within Secondary Schools in Hawaii

Using an RPP approach to developing a shared evaluation and research agenda for CS for All RPP
Acknowledgement

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Any opinions, findings and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.
Plan for this panel discussion

- CS education in K12 - challenges and opportunities
- What is RPP and RPPforCS
- Our projects
- How do RPPs work in practice
- Q&A
- Audience discussion
Question

Why did you choose this session?
Question

What role(s) has research played in education change initiatives that you have been part of?
Report of the 2018 NSSME+
DECEMBER 2018

Eric R. Sanilower
P. Sean Smith
Kristen A. Malzahn
Courtney L. Plumley
Evelyn M. Gordon
Meredith L. Hayes
Where is CS Instruction Available?

Elementary  26 %

Middle     38%

HS         53%

AP CS/CSP  15%

Lower in high poverty, south/midwest, smaller schools

Only 52% in HS are taught by teacher in the school

(other virtual, college, CTE center)
Who are the students in HS CS Ed?

28% Female

28% Historically underrepresented

Less for CS courses that qualify for College
Who teaches CS

60% Male

94% White

63% with 5 years or less experience teaching CS

25% with degrees in CS, Eng, Info Sci, or CS ED

(compared with 91% for science teachers)

44% certified in CS

(most others math and business)
Using an RPP approach to developing a shared evaluation and research agenda for CS for All RPP
What is a Research-Practice Partnership (RPP)?

RESEARCH-PRACTICE PARTNERSHIPS are long-term, mutually beneficial, formalized collaborations between education researchers and practitioners, a promising strategy for producing more relevant research, improving the use of research evidence in decision making, and engaging both researchers and practitioners to tackle problems of practice.

(National Network of Education Research Practice Partnerships, n.d.).
## What are some models of Research-Practice Partnerships?

<table>
<thead>
<tr>
<th>Model</th>
<th>Description of Model</th>
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<tbody>
<tr>
<td><strong>Research Alliance</strong></td>
<td>RPPs engage in <strong>analyses of the implementation and outcomes of district policies</strong> and programs. Researchers share findings with educational decision makers and <strong>work with them to develop solutions</strong> (e.g., the University of Chicago Consortium on School Research).</td>
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<tr>
<td><strong>Design Based Implementation Research Partnerships</strong></td>
<td>Researchers and educational leaders <strong>co-develop and test strategies</strong> or tools for improving teaching and learning system-wide. They use an approach <strong>adapted from the learning sciences</strong> for conducting research on interventions in classroom, school, or district contexts.</td>
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<tr>
<td><strong>Networked Improvement Communities (NICs)</strong></td>
<td>RPPs engage in <strong>continuous improvement research</strong> to work on problems of practice. NICs are <strong>networks of people and organizations</strong> that can span multiple jurisdictions (e.g., districts, universities) and that are organized to achieve common improvement aims.</td>
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Framework: Dimensions for Assessing RPPs

IMPROVEMENT PROJECT

1. Building Trust & Cultivating Relationships
   - Shared Interest in CS “Problem”
   - Intentional Mechanisms to Foster Relationships

TRUST

2. Conducting Rigorous Research to Inform Action

3. Supporting Partner Organization in Meetings its Goals

Meet Improvement Goals

4. Producing Knowledge that can Inform Other Efforts

Build Research-Based Knowledge

5. Building Capacity of Researchers, Practitioners, Orgs.

Build Professional Capacity

From a presentation given by Erin Henrick to the RPPforCS Community, December 19, 2018
Number of projects by target grade

Note: total may add to more than the total number of projects due to projects addressing multiple grade bands
Number of projects by curriculum used

Note: total may not equal the total number of projects
Number of projects by partnership approach

Note: total may not equal the total number of projects
1. Develop a **Connected Community of Practice**
2. Develop & manage a **participant-driven, multi-site** research agenda.
3. Convene a **Researcher-Evaluator Working Group** (R-EWG) to develop a process for advancing the **shared-research agenda**
4. Collect **data**
   - about RPPforCS projects’ **implementation**
   - **common impact data**
5. Provide an **infrastructure for dissemination** of project work
Our research questions

1. What are the RPP-specific activities and partnership characteristics that shape the extent to which/ways in which RPPs meet their goals for quality CS education?

2. How do different RPPs define and design around different indicators of healthy RPPs and how do they evolve over time?

3. How do RPPs measure their effectiveness at affecting CS education and broadening participation?
Jill Denner

Next Door to Silicon Valley: An RPP to Address Disparities in Access and Expectations for Computer Science Education & A Coordinated, Cross-Institutional Career and Technical Education Cybersecurity Pathway
Mutual problem of practice:
Disparity in access (for low income and Latinx students) and expectations (for female students) to have quality opportunities to learn computer science or practice computational thinking.
Motivations to Work Together

- Researchers: after years of running after school programs, wanted to do research that would be used to inform practice
- Practitioners: the district felt pressured by parents and newly adopted CS standards to do something in computer science education
Initial (unrealistic) Goals for Two Years

- Design a CS Ed pathway from 3rd-8th grade that connects with high school CS
- Develop instructional materials that teachers can use to integrate CS into their core subjects
- Design brief interventions to address unconscious bias about who does CS
- Provide teachers with intensive and then ongoing professional development
- Hold regular forums to engage parents and other community members
Major Accomplishments

Student Access to CS
- Designed activities for a 3rd-8th grade pathway to integrate CS into core subjects
- Added after school activities at Title 1 school

Teacher Professional Development
- Tested a model of instructional coaching

Parent Engagement
- Tested evening family events in Spanish

Systems Change
- Increased knowledge and buy-in by administrators
- Collected/shared data on student, family, and teacher attitudes and experience with CS
- Identified a plan for the next grant
What we didn’t do

- Increase equity in access to CS
- Address bias in expectations of teachers, students and parents
- Prepare many teachers to integrate CS
- Leverage community resources for under-resourced schools
Why were all our goals not achieved?

We were an early phase RPP!
## RPPs: Process Dimension

<table>
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<tr>
<th>Early Phase</th>
<th>Middle Phase</th>
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<tr>
<td>Curious about how we can help each other</td>
<td>Developing sense of how we can help each other</td>
</tr>
<tr>
<td>Willing to try new and different roles</td>
<td>Clarifying roles</td>
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<tr>
<td>Resources for short-term, specific work</td>
<td>Resources for a single line of work on multiple projects</td>
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(from Penuel & Gallagher, 2017, Are we a partnership yet? diagnostic tool)
## RPPs: Impact Dimensions

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<th>Early Phase</th>
<th>Middle Phase</th>
</tr>
</thead>
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<tr>
<td>Create strategies to address the problem</td>
<td>Improving organizational policies and processes that directly impact classrooms</td>
</tr>
<tr>
<td>Identify existing data and additional data needed to evaluate impact</td>
<td>Carrying out rigorous research on implementation and outcomes</td>
</tr>
<tr>
<td>Clarify the new knowledge the RPP can generate</td>
<td>Sharing strategies for organizing RPP work and adapting others’ strategies</td>
</tr>
<tr>
<td>Develop strategies for organizing joint work</td>
<td>Adapting other RPPs’ strategies for organizing our partnership</td>
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Recommendations for an Early Phase RPP

- Find a partner that sees value in research (or practice)
- Make sure everyone understands what an RPP entails
- Set realistic goals (and roles) that can be accomplished with the time and money available
- Make sure there is buy-in and understanding at key administrative levels
- Take time to build relationships and clarify procedures for communication and decision-making
Debasis Bhattacharyya

CSP4Hawaii: Deployment of Computer Science Principles Courses within Secondary Schools in Hawaii
CSP4HI – Status Report

Debasis Bhattacharya, JD, DBA

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#csp4hi

maui.hawaii.edu/csp4hi
Current Status – Cohort 1

• Cohort 1
  • 17 HS DoE teachers
  • 11 HI DoE HS
    • Aiea, Baldwin, Campbell, Castle, E-School, Kapaa, King Kekaulike, Konawaena, Lahainaluna, Leilehua, Maui
    • Curriculum: UTeach (Aiea, Baldwin, Campbell, Kapaa, King Kekaulike, Konawaena, Lahainaluna) Code.org (Castle, Leilehua, Maui), CodeHS (E-School)
  • Recruitment of Teacher #2 – 6 schools!
    • Baldwin, Campbell, Castle, Konawaena, Lahainaluna, Maui

• Cohort 2 – Target: 30 teachers from 15 HI DoE schools
  • UTeach Workshop is June 17-21, 2019
  • All Cohort 1 teachers are invited to attend on Day 1 or June 17, 2019
  • Kalani HS, Kaiser HS, Kealakehe HS, Molokai HS (2), Kauai HS (2), Farrington HS (2)
CSP4HI + CS First

• Key Goal of CSP4HI project
  • Increase interest in computer science within HI DoE high schools
  • Increase involvement of minorities, girls, underrepresented groups
  • Increase the pipeline of students who take AP CSP -> AP CSA -> Major in CS

• CS First
  • Computer club activities targeted for ages 9-14
  • Complete themes with lesson plans for activities that last 10 hours
  • Free online course on Computational Thinking – [here!](#)
  • Exploring Computational Thinking (ECT) labs and materials – [here!](#)
  • All code and materials are free. ECT materials can be use in AP CSP now
Leiny Garcia

CONECTAR: Collaborative Network of Educators for Computational Thinking for All Research
Multilingual Learners in 3rd - 5th grade

Multilingual Learners (ML) represent one of the fastest growing populations in US schools, yet they are dramatically underrepresented in CS courses and careers.

Santa Ana Unified School District
60% English Learner’s in grades 3-5

Lack of research and quality of CS instruction and identification for ML’s
District-wide Problems of Practice

To **systematically offer** computer science education in the district beginning in elementary

To **improve literacy scores** particularly for multilingual students

To **create instructional materials** that meet the needs of predominantly Latinx, low-SES, and language learners
Goals for CONECTAR:

YEAR 1

To investigate the teaching and learning of computational thinking

To develop and pilot instructional materials that support district students & align with Common Core (ELA)

YEAR 2

To iteratively pilot test these materials for broader implementation and assessment

To establish a successful Researcher Practitioner Partnership

*investigation by Creative Stall, curriculum by Stefania Servidio, class quiz by ProSymbols, partnership by Artem Kovyazin from the Noun Project
Year 1
Investigate
(monthly meetings with district administrators)

- Conducted a **district-wide survey** of elementary school teachers with a focus on CS teaching techniques and experiences

- Nationwide search for curriculum ➢ **CSinSF**

- Piloted **CSinSF** as is in 5 classrooms mid school year
Researchers and same 5 teachers worked together to adapt the CSinSF curriculum to meet the needs of the district’s culturally and linguistically diverse students.

**Year 1: Develop & Pilot CONECTAR 2018 Summer Institute**

**Focused on creating a Community of Practitioners**
(2 day workshop)

**Curriculum Goals**
- To align the CSinSF curriculum with ELA and ELD standards
- To provide linguistic scaffolding to meet the needs of multilingual, multicultural students
- To develop a Storytelling unit
- To provide culturally responsive pedagogy and materials
Researchers and same 5 teachers worked together to adapt the CSinSF curriculum to meet the needs of the district’s culturally and linguistically diverse students.

**Curriculum Goals**
- To align the CSinSF curriculum with ELA and ELD standards
- To provide linguistic scaffolding to meet the needs of multilingual, multicultural students
- To develop a Storytelling unit
- To provide culturally responsive pedagogy and materials

**ELA/ELD standards were very narrow. Per request of our teachers, standards were adopted to new literacy adoption benchmark of the district**

**ADDED**
- Integrated inquiry based approaches to learning
- Lesson Plan Templates
CONECTAR computer science curriculum introduces computer science as a collaborative and engaging discipline to children in grade three to five. The curriculum consists of three levels in increasing difficulty, with approximately 5 units and 15-20 lessons in each unit.

Lessons are designed to be implemented in 45 to 60-minute periods approximately once per week.

The curriculum is adapted primarily from Creative Commons licensed resources developed by the Computer Science in San Francisco, the ScratchEd team at the Harvard Graduate School of Education and Code.org.

Level 1

Link to Level 1 Student Workbook
Very first linguistic scaffolding methods for CS (only existed for math and science)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Emerging</th>
<th>Expanding</th>
<th>Bridging</th>
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<tbody>
<tr>
<td>What are the different ways you have interacted with computers?</td>
<td>I use computers to ___</td>
<td>When I use a computer I ___</td>
<td>I interact with computers in different ways, such as ___</td>
</tr>
<tr>
<td>What creative projects have you made with computers?</td>
<td>I have made ___ with computers.</td>
<td>I have created ___ with computers.</td>
<td>Some creative projects I have made with computers are ___</td>
</tr>
<tr>
<td>What have you created in Scratch?</td>
<td>I made the Scratch cat/ character ___</td>
<td>I have used ___ to make ___ in Scratch.</td>
<td>Some creative projects I have done in Scratch are ___ I used ___ and ___, which make ___ happen.</td>
</tr>
</tbody>
</table>

I used ___
7 teachers are currently piloting the Level 1 curriculum in their classrooms

**In-Person Reflections:**
after a CONECTAR lesson at school site

**Design/Discussion Sessions:**
Monthly in-person meetings at district headquarters with administrators

Researchers are gathering data:
1. Observations
2. Student Projects
3. Student Interviews
4. Assessments

Year 2
Iteratively Pilot Test
- A structure and routine is important!
- Ensure that everyone has an ACTIVE role.
- Aim for incremental improvements in partner organizations.
- On maintaining trust:
  - As researchers, the data collection plan must be respectful of partners roles, comforts, and commitments.
Questions?