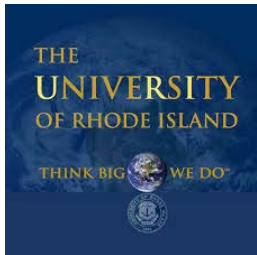# Computing in Elementary School: An Exploration of Computational Thinking Approaches and Concepts Across Disciplines (1813224)

Sara Sweetman
Jay Fogleman
Vic Fay-Wolfe

THE
UNIVERSITY
OF RHODE ISLAND
THINK BIG WE DO

The intention of the exploratory study is to better understand the current landscape of how elementary teachers engage students in the skills and concepts associated with computing, so that future implementation efforts are viable and improve teaching and learning in all disciplines.

NSF

Concerns for Careful CS Implementation

New computer science curriculum and mandates will likely have the unintended negative consequence of taking away from the already too little time on science and social studies.
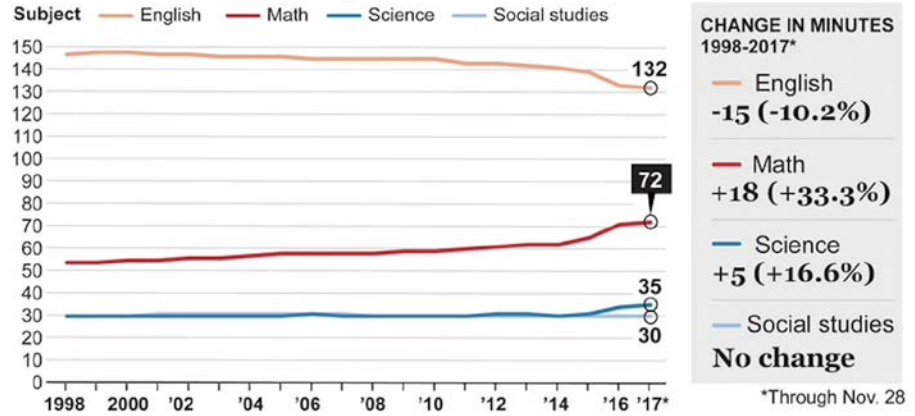

Computer science must be taught in every public school classroom.

Grade 3: Minutes of instruction per day
Illinois statewide daily average

Subject — English — Math — Science — Social studies

	CHANGE IN MINUTES 1998-2017*	
— English	-15 (-10.2%)	
— Math	+18 (+33.3%)	
— Science	+5 (+16.6%)	
— Social studies	No change	

English: 132
Math: 72
Science: 35
Social studies: 30

*Through Nov. 28

Illinois State Board of Education

Problem of Practice

FOSS Science Lesson

Students plant a miniature lawn in a cup of soil—rye grass seeds and alfalfa seeds. They draw, compare, and record the growth of the two plants over time.

CODE.ORG Lesson

In this lesson, students will relate the concept of algorithms back to everyday real-life activities by planting an actual seed.

STEM + C Grant

Research Questions

How do computational thinking concepts align with those in elementary core disciplines ?

How often and in what ways is CT currently being taught in grades K-5?
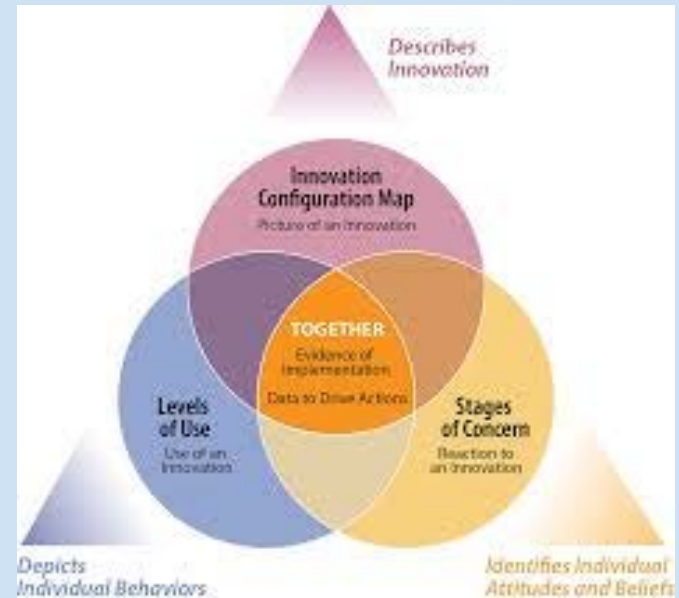
Which CT concepts and approaches more strongly correlate with which disciplines?

What teacher-level and school-level factors explain the use of CT across the curriculum?
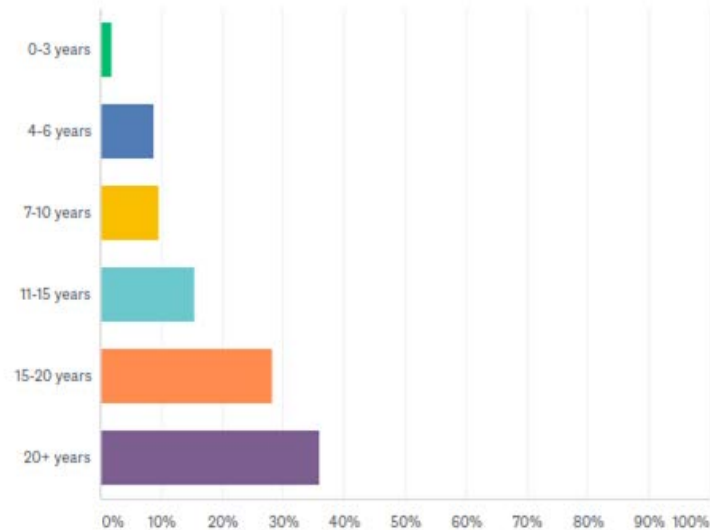
Integration & Implementation

George, A. A., Hall, G. E., & Stiegelbauer, S. M. (2006). *Measuring implementation in schools: The Stages of Concern Questionnaire.* Austin, TX: SEDL. Available from http://www.sedl.org/pubs/catalog/items/cbam17.html
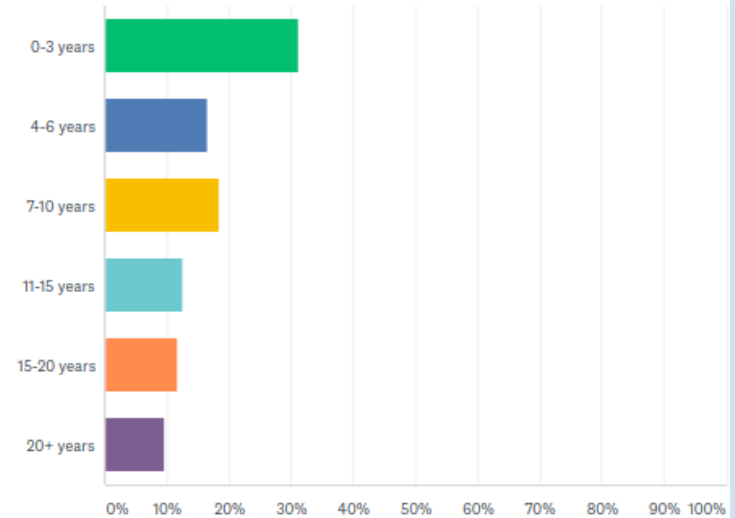
Experienced Teachers in New Positions

How long have you been an educator?
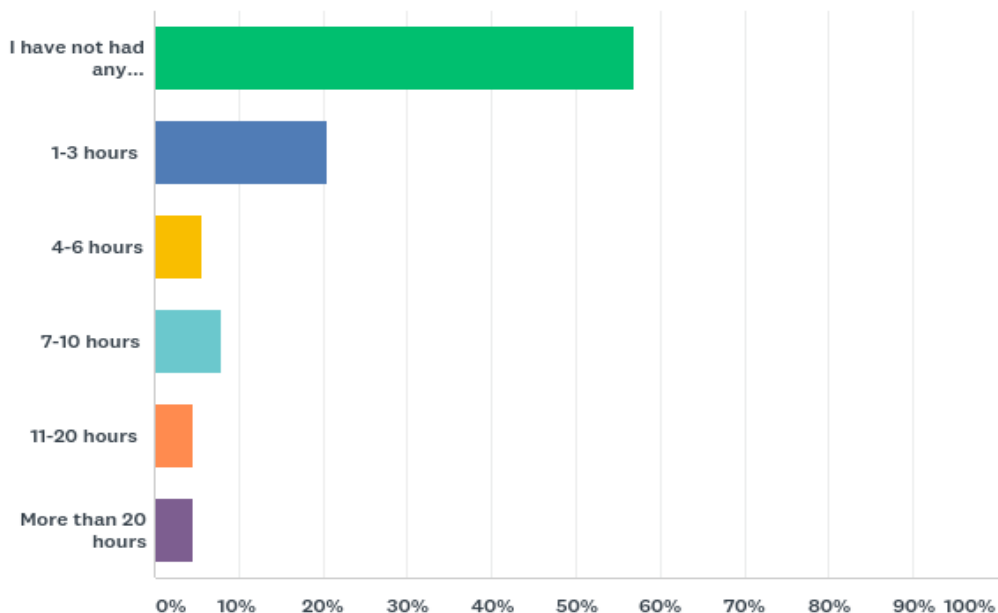Answered: 103   Skipped: 23

How long have you been in your current position?
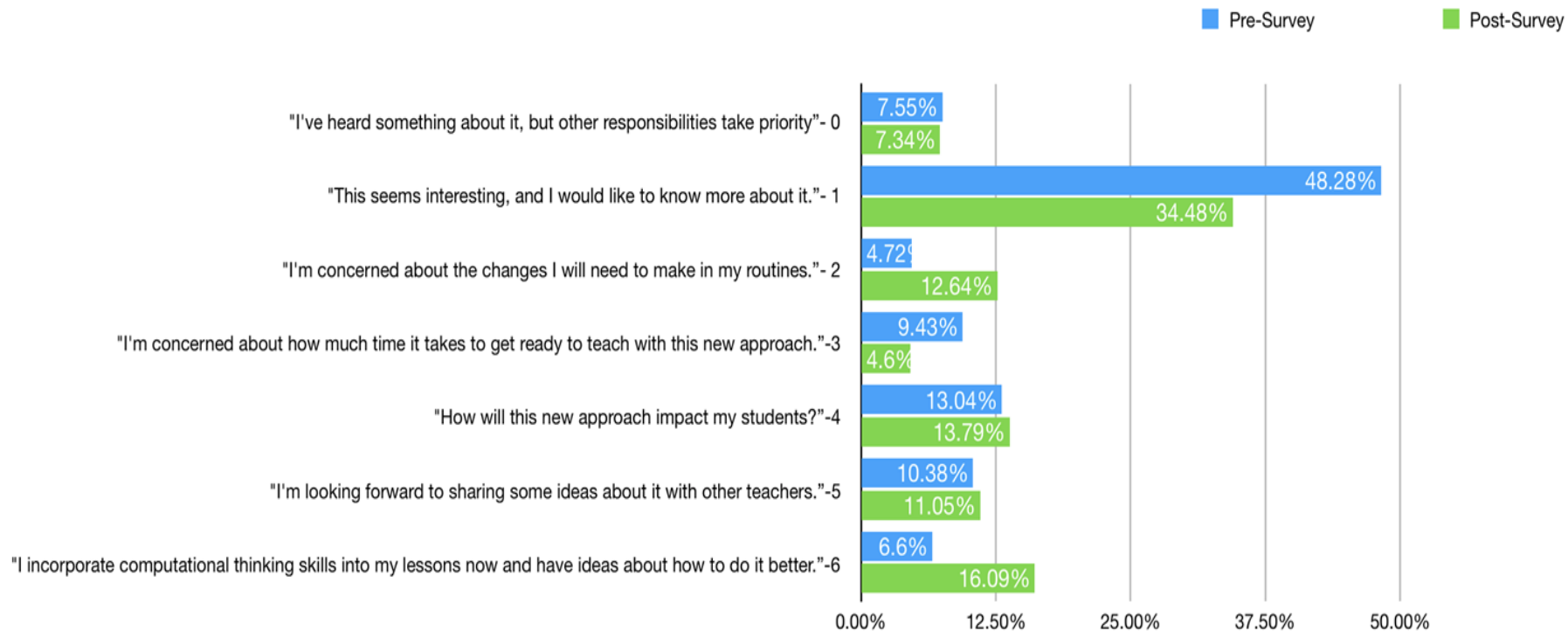Answered: 103   Skipped: 23

Little to No Professional Development

Q39 How often have you participated in professional development on computer science, computing, or computational thinking?
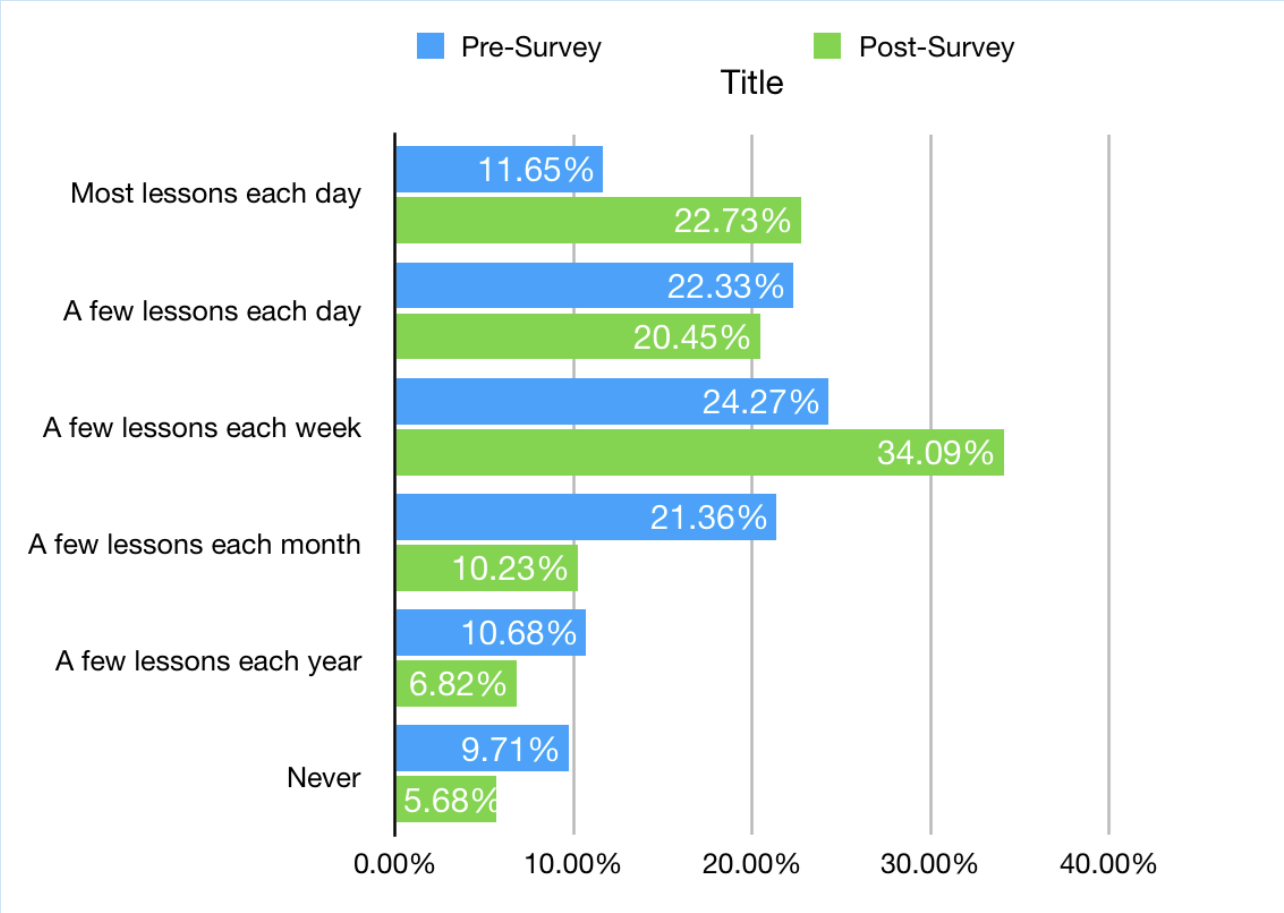
Stages of Concern: Pre-Post Survey

Legend: Pre-Survey (blue), Post-Survey (green)

Statement	Pre-Survey	Post-Survey
"I've heard something about it, but other responsibilities take priority"- 0	7.55%	7.34%
"This seems interesting, and I would like to know more about it."- 1	48.28%	34.48%
"I'm concerned about the changes I will need to make in my routines."- 2	4.72%	12.64%
"I'm concerned about how much time it takes to get ready to teach with this new approach."-3	9.43%	4.6%
"How will this new approach impact my students?"-4	13.04%	13.79%
"I'm looking forward to sharing some ideas about it with other teachers."-5	10.38%	11.05%
"I incorporate computational thinking skills into my lessons now and have ideas about how to do it better."-6	6.6%	16.09%

Time Teaching CT in Elementary

Awareness
is just the first step….

By better understanding how CT concepts and approaches integrate authentically into math, science and other subjects, policymakers and district leaders can be more intentional in supporting both teachers and students to develop an understanding of core computing skills that will provide a strong foundation for further computer science applications.