Lessons learned from an EAGER project for developing a framework for CT integration in elementary schools

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Rationale

- Limited empirical or practical guidance for how to enact these initiatives;
- Lack of clarity about what integrated CT looks like in K-5 contexts

K-5 CS initiatives are growing with an emphasis on integration Administrators & teachers indicate a need for support for CT Integration

- Need for tools, rubrics, frameworks to
 - Guide decision-making
 - Monitor implementation
 - Be responsive to challenges to integration

- Indicators for integration
- Multiple stakeholder perspectives:
 - Teachers, administrators, PD providers, etc.

We are developing and studying a school-wide CT integration framework

Previous Work informing this study

New York City Study

- Funded by the Learning and Technology Fund; Robin Hood Foundation, Overdeck Family Foundation and the Siegel Family Endowment
- Case study approach across multiple schools to examining CT integration models
- Beginning of framework development

Illinois Study

- NSF-funded (STEM+C EXP)
- Began as work in one school that was integrating CS and CT into math instruction.
- Deep dive into lesson development, teacher successes and challenges, implementation choices

Research Questions

- 1. What resources do administrators and teachers need to help determine whether they are prepared to integrate CT into the curriculum?
- 2. What features of a framework/rubric will help administrators and teachers identify strengths, weaknesses, and areas for improvement with respect to CT integration?
 - a. How do those features differ among user groups?
 - b. What formats of the resources are most useful for each user group?
- 3. Which "indicators of CT readiness" are most recognizable and valued by users and why?
 - a. What differences exist in how each group defines the indicators and judges their importance?
- 4. Is there preliminary evidence that the use of the framework/rubric is associated with the "successful" integration of CT across elementary curricula, based on self-assessments and observations of implementation?

Iterative Development of the Framework

Original Framework (2017)				
	EAGER project began (2018)			
-Case studies in NYC highlighted the need for a robust framework to guide implementation.	-Development of a "teacher" version of the framework	Continued refinement (2019)		
-Original framework aimed at administrators.	-Interviews with teachers, PD providers, curriculum developers for feedback -Framework refinement	-Refinement based on interviews and feedback		
Need for multiple versions & Inpacking constructs uncovered.		-Piloting the Framework versions with school teams		
		-Revisions based on pilot testing		

The Framework: Part A: Descriptions of CT and examples of integration

- 1. Levels of Integration
- 2. Applications of Content Integration
- 3. Range of integrated activities



Adapted from Vasquez et al, 2015

The Framework: Parts B and C: Using the Framework

C. Steps to consider when using the Framework

There is no single 'best way' to use the framework to guide your schools' CT integration effort. The steps below provide guidance on how to approach this work. You may need to make adjustments to the process or timing to meet the unique needs and context of your school.

- **Step 1**: Set goals for CT integration at your school and for within your curriculum.
 - What is your school's goal for CT integration? Where and how do you envision it happening?
 - What are your goals for CT integration within your curriculum? What do you envision integration looking like?
 - What is your long-term (e.g., in 5 years) vision for how CT integration will look in your school?
- Step 2: Conduct a CT self assessment
 - Where is your school now? What, if any, integration has taken place already in the classroom?
 - Which elements are at the beginning, approaching and achieving levels? Which are not a priority at this time?
- Step 3: Determine which elements are a priority to focus on
 - Of the elements that are at the beginning or approaching levels, which are most important to focus on first?
- **Step 4:** Develop an action plan to address the elements that are a top priority. We recommend starting with a one-year plan.
 - How will you go about addressing the element?
 - Who needs to be involved?
 - What is the timeline for working on this element?
 - How will you know you are making progress on the element? What will you use to measure success? When will you measure success?
- **Step 5:** Assess and take stock of your progress towards addressing priority elements at regular intervals (e.g., every three months)

The Framework: Six Focus Areas

SECTION A. TEACHER KNOWLEDGE, PEDAGOGICAL CONTENT KNOWLEDGE, AND FACILITY WITH TOOLS TO SUPPORT STUDENT LEARNING OF CT AND CORE SUBJECTS

SECTION B. TEACHER SUPPORTS

SECTION C. CURRICULUM FEATURES AND LESSON/UNIT PLANNING

SECTION D. COMPUTATIONAL THINKING ASSESSMENT

SECTION E. STUDENT IMPACT

SECTION F. FAMILIES AND THE SCHOOL COMMUNITY

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School leaders and teachers should help students' families learn about the value of integrating computational thinking across the elementary curriculum and, when possible, help them engage in activities that include aspects of CT.

Element F1. Teachers' efforts to educate students' families about CT and CT integration								
Description	Examples of what it might look like when implemented effectively in your classroom	Never (1)	One or Two times a year (2)	One or two times a semester (3)	Once a month or more (4)			
I create opportunities for my students' families to learn about CT and to understand how I am integrating CT across the curriculum within my classroom	 Over the course of the school year I provices students' parents or guardians with opportunities to learn about CT and how they are applying CT skills across the curriculum in their classrooms, such as sending home parent letters or discussing CT integration during parent-teacher meetings I clearly articulate to students' parents or guardians their vision for CT integration across the curriculum and articulate how their students will apply CT in alignment with other content standards for <i>problem framing and problem solving using a computer</i> or as a creative activity for generating ideas and products I regularly share with my students' parents or guardians samples of classwork, either through unplugged activities or plugged 							

Self-Reflection Question: Do I provide multiple opportunities for my students' families to learn how CT is being integrated across the curriculum? What are some ways I can share examples of students' work and progress in how they are applying CT skills with their families? What support do I need to engage families?

CT integration in different settings?

Commonalities

- Launching point for CT integration:
 - Academic language integration (e.g., decomposing a math problem)
 - Unplugged activities
- Emphasis on professional development
- Challenges are both general (e.g., time, tech) and CT specific (e.g., articulated definition of CT)

Differences

- Tools used (Scratch, unplugged only, robotics)
- Dosage/allocated time
- Horizontal (grade level) vs. vertical (across grade) initial emphasis
- Content area (ELA, math, science, STEM)

Questions to ponder

1) What do we consider "successful" CT integration into the curriculum (different levels of integration) and what does it look like in different settings?

2) How does integration differ across the STEM disciplines and across grade levels?

3) What supports do schools and educators need, both within our framework and through other resources, to support successful integration?

Want to look at it further and provide feedback: https://go.edc.org/CTFramework-NSFSummit2019