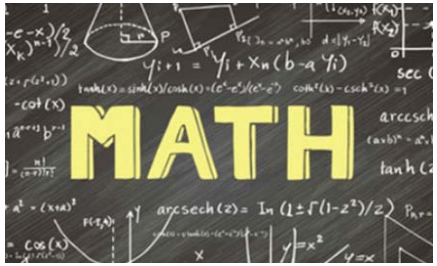

STEM + C

Infusing Computing

Presented by Marnie Hill
North Carolina State University

Computational Thinking

What is it?

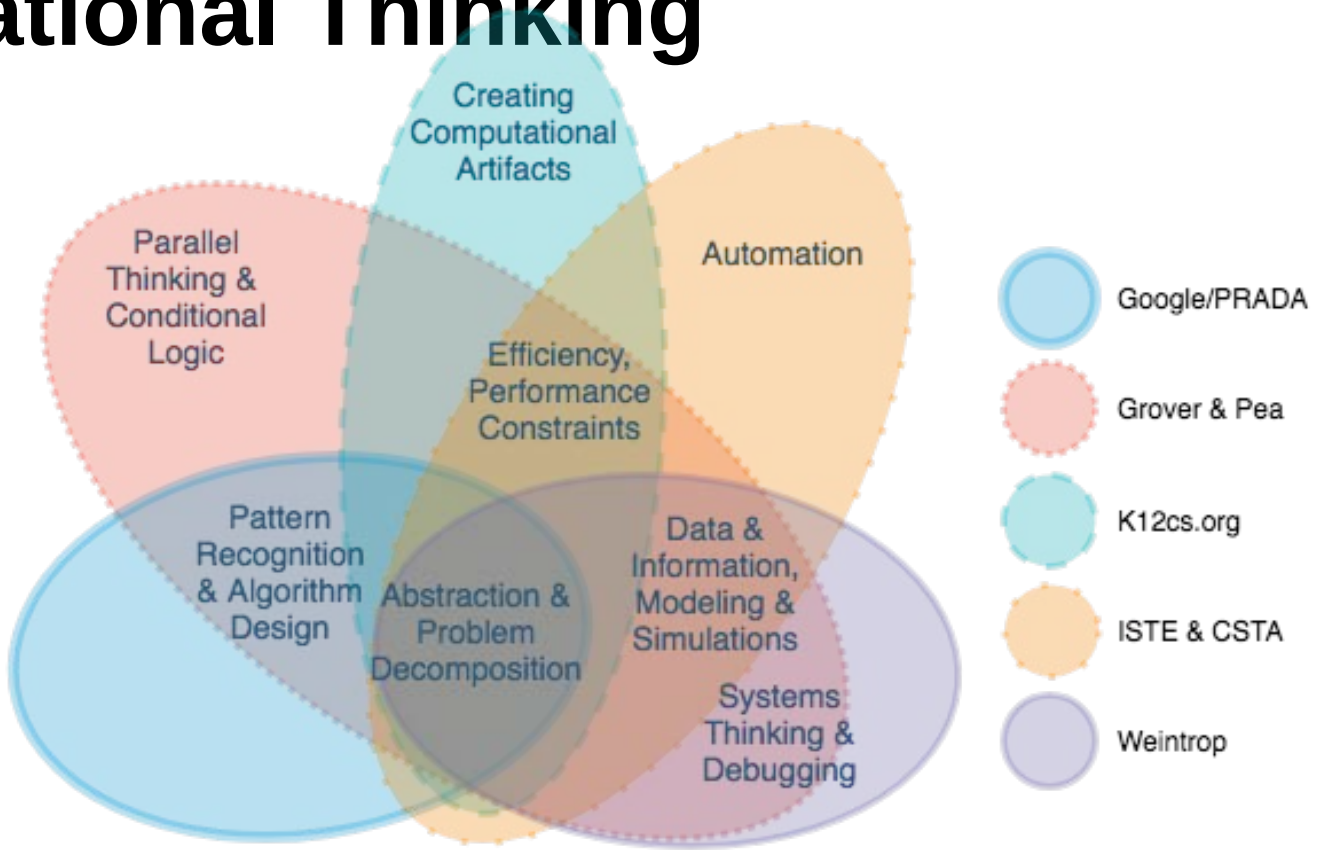

Image from Dong & Cateté, SIGCSE, 2019

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How can we incorporate it into classrooms? **PRADA**

- **P**attern **R**ecognition
- **A**bstractions
- **D**ecomposition
- **A**lgorithms

Energy Resource Management in Cellular

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Scaffolded Instructions - Piloted for NSF RPP

Provide support to help minimize effects of preparatory privilege

- Students may have varying levels of computing experience going in
- Hour of Code, Summer Camps, Computing electives

Recommended progression ->

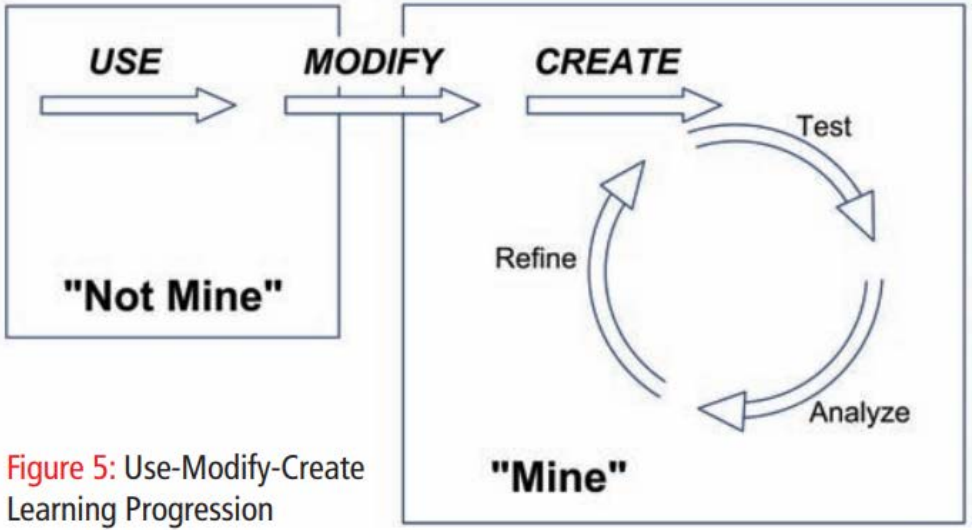

Figure 5: Use-Modify-Create Learning Progression

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Use, Modify, Create

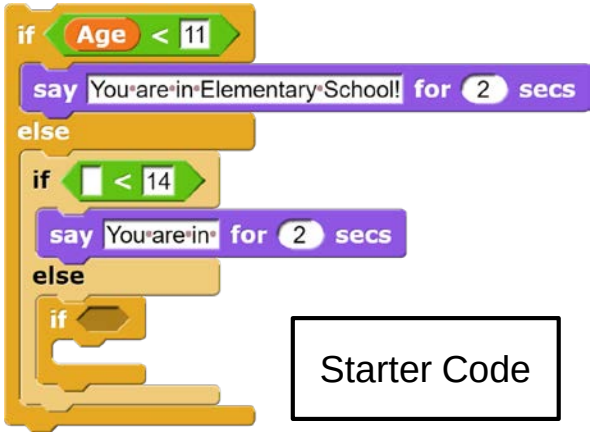
Unplugged modeling activity, pseudocode

Use a simple simulation to get students familiar with the coding environment

Modify simulation code to align more with student mental modes

- fix buggy code
- provide starter code
- minimize extraneous cognitive load

Create your own extensions



Starter Code

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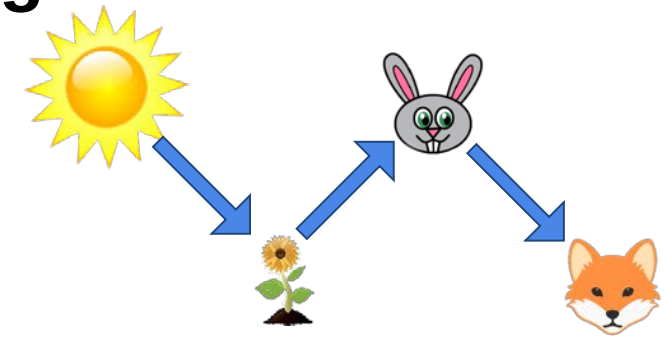
From Instructing to Facilitating Student Creations!

What if students don't know what to add?

What if teachers don't know the answer?



Food Chain Activity

Provide a list of recommended extensions

- Include important code blocks that should be used
- Give teachers a demo answer for each option
- Teachers can help facilitate student CT
- Students get to choose their own model extensions
- Allows for wide-range of backgrounds to explore/succeed

Extensions

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Infusing Computing PD - STEM+C Grant

240 teachers completed summer PD over the last two years

Daily Structure **3C**:

Code - Teachers learn coding skills by completing CT assignments with UMC

Connect - Teachers group by discipline and work with facilitators to make connections between their discipline and CT

Create - Teachers develop team CT projects, by school or discipline

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Initial Findings - Summer 2019 PD

This year 40 team projects were created

Teachers have started implementing their *own* CT coding activities that meet their *own* learning objective requirements within their *own* classroom

Several teacher groups have requested PDs for their entire school or for STEM teachers at middle school/high school pairs

Teachers are becoming owners and champions of CT in their discipline

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Ongoing Research

- Instructor Influence on student programing behaviors
- Design patterns of CT in teacher projects
- Data driven analysis of student code shapes, how they go about completing sub goals, get stuck, or find efficient paths
- Best practices for design of CT coding activities in infused classrooms

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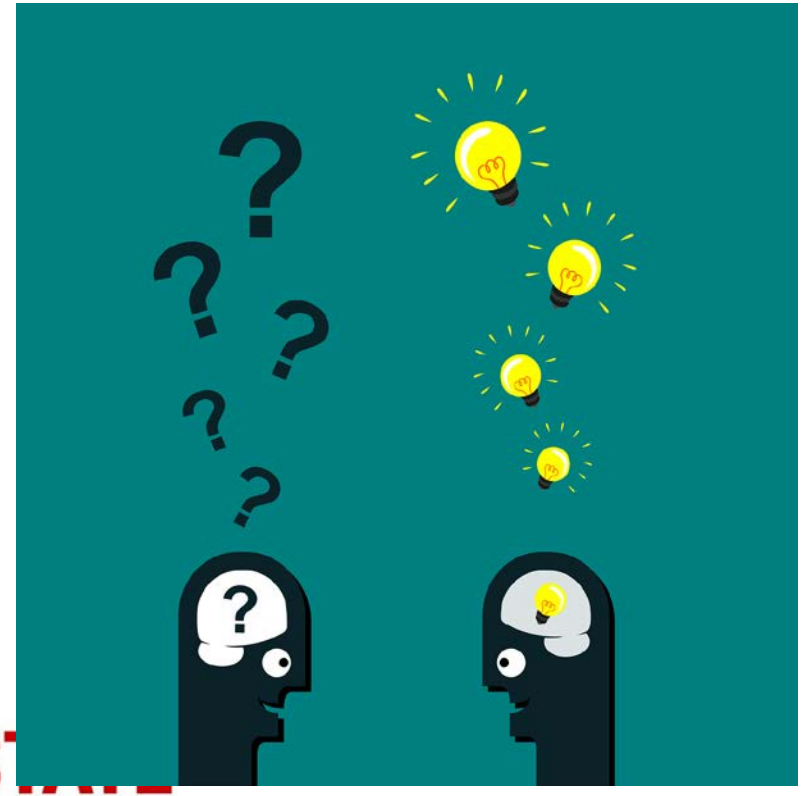
QUESTIONS? - mhill@ncsu.edu



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This material is based upon work supported by the National Science Foundation under STEM+C 1742332 & 1742351. 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 NSF.