Computational Thinking in Early Childhood Education

I recently attended a virtual STEM conference; one of the sessions that intrigued me was 'How to foster computational thinking skills in kindergarten students'. That caught my attention…if computational thinking is a skill supported in kindergarten, how can we support CT for 3 and 4 yr. olds in a developmentally appropriate manner? Is it relevant? What is it?

Well, let's start with a bit of history, the lack of inclusion of women and minorities in the STEAM fields, specifically computer science is not new, educators and school administrators have been addressing it over the past few years by intentionally targeting their efforts in providing experiences to students.

One of the proposed solutions has been to start students down the path of computer science earlier. In EdTech: Focus on K12's Fall 2016 issue, Vince Bertram, the CEO of Project Lead the Way, wrote about this very topic.

"Students makes decisions about whether they're good at math and science as early as second grade, we have to inspire students at an earlier age, demystify subjects like computer science and help them understand how math and science are tools to solve problems rather than equations to solve for a test." writes Bertram.

If we want to start earlier, let's start inspiring students in preschool, I thought. Then I realized that I needed more information about computational thinking. Computational thinking refers to the thought processes involved in expressing solutions as computational steps or algorithms that can be carried out by a computer. (Cuny, Snyder, & Wing, 2010; Aho, 2011; Lee, 2016). In other words, computational thinking is an approach to problem solving; it is taking apart a problem, figure out how to solve it using what we know about computation. It has four major components:

- Decomposition- Brake it down, what are the components/parts, how would you divide the task.
- Pattern Recognition- Finding similarities and differences between parts in order to make a prediction
- Pattern Generalization or Abstraction-Finding principles that generated this pattern.
- Algorithm Design- Develop a step-by-step instruction that solve similar problems.

Wait a minute! Some of these concepts are very familiar for preschool educators…Are we supporting Computational Thinking already? How can we make it intentional? I also found out that there is a model used by educators to support students' development of computational thinking by allowing them to inspect, manipulate, and customize mechanisms. This progression, called Use–Modify–Create, developed by the ITEST Working Group on Computational Thinking (Lee et al., 2011), has been shown to support and deepen students' computational thinking experience.

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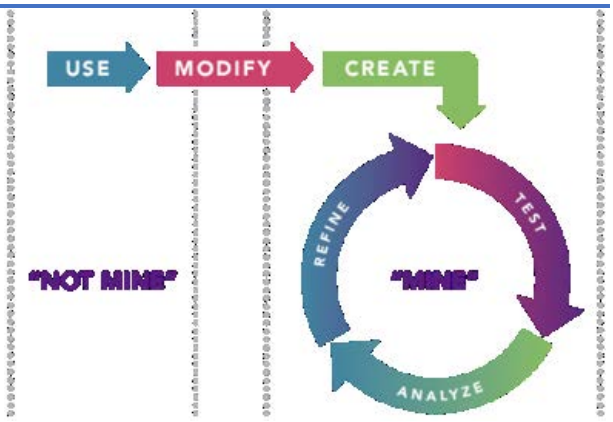


After looking at this image, I thought, "yes, we could support CT skills at a preschool level!" Children use, modify and create a variety of contraptions when you as an educator or parent provide a positive attitude, space, materials, and scaffolding.

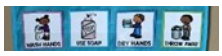
Now, is it relevant? Is it worth the effort? Well, it looks like CT is now an essential component of the new education paradigm. Some educational systems are adding this subject to enhance their existing curriculum. This can be an opportunity to start closing the early childhood education gap, when preschool age children enter kindergarten. For the world of ECE, it could mean that we just need to keep fostering children's critical and creative thinking skills, provide open-ended materials, ample space for their creations, allow them to think differently, to get to a different answer/solution; they might be just solving the problem in a more creative way. Aren't these the FUNdations for CT?

Computational Thinking activities for preschool age children:

-Decomposition- Brake it down, what are the components/parts, how would you divide the task. (Deconstruction playdough structures).

- Pattern Recognition- Finding similarities and differences between parts in order to make a prediction (Pom pom patterns)

- Pattern Generalization or Abstraction-Finding principles that generated this pattern. (counted by two)



- Algorithm Design- Develop a step-by-step instruction that solve similar problems. (visual step by step directions).

Stay tuned for more…..

Want to learn more about it? Google offers a course for educators (PK-12th)

https://edu.google.com/resources/programs/exploring-computational-thinking/

Computer science website with activities for KG-12th grade. You can modify some for preschool. https://classic.csunplugged.org/activities/

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