Coding with Little Learners

- Coding is all the buzz in the education world, but does it belong in early learning? YES! Coding with 3- to 7-year-olds is more about language development, patterns, sequencing, problem solving, critical and creative thinking, and collaboration than about computers and technology. In this workshop we will examine how pre-coding and coding belong in early learning and how you can include computational thinking in a more intentional way within your learning activities. Concrete examples and experiences in classrooms will be shared, and time for discussion will be included.

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Coding... what is it?

Translating human language to a language a machine can understand

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So, you have to know the language and syntax (structure, order, vocabulary) of the item you are coding...

However…

This definition implies knowing the steps to achieve a task and the instructions needed to have the machine complete the "task"

Computational Thinking

Thinking like a computer scientist…

The computer will not solve problems without a human first working through how to approach the problem.

Computational Thinking

The 2016 ISTE Standards for Students defines the goal for computational thinkers as "students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions."

https://www.iste.org/explore/articleDetail?articleid=936&category=Innovator-solutions&article=Turn+coders+into+computational+thinkers

Some Key Skills in Computational Thinking (and Coding)

Decomposing

breaking down a problem into smaller chunks

Generalizing

recognizing patterns and applying them to new thinking

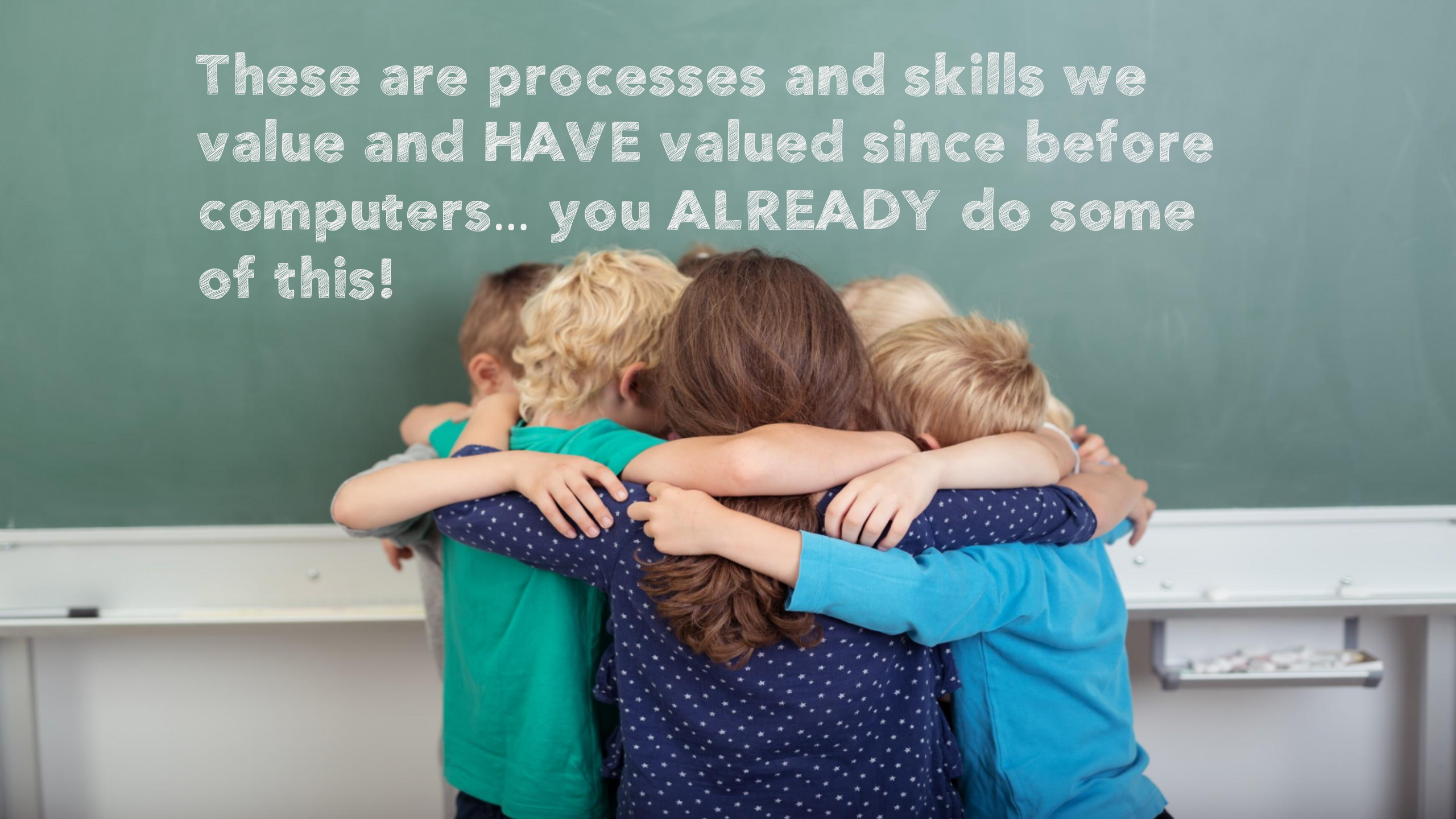
Computational Thinking and Coding skills (Continued)

Algorithmic thinking

pulling together step-by-step plans to solve problems

Evaluation

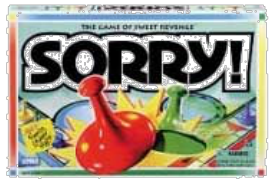
thinking about the ways a solution meets the needs of the problem

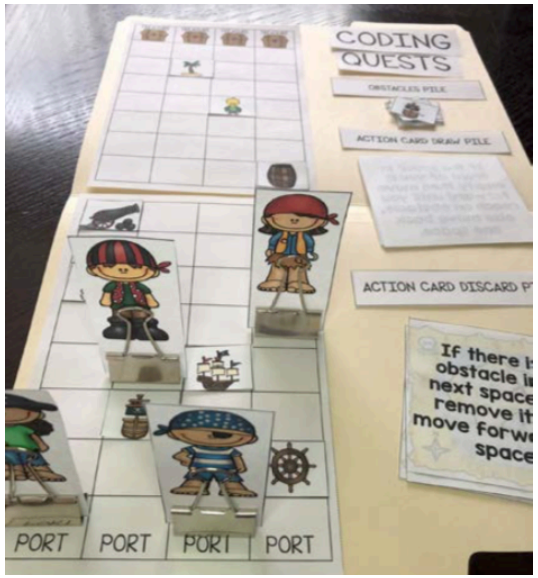

These are processes and skills we value and HAVE valued since before computers... you ALREADY do some of this!


Simon Says...

If-Then Conditional
Simon Says

Board Games





- Steps
- Directional words
- Repetition
- "If-Then-Else"

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Songs and Dances with Movements and Repetition

- Steps
- Sequence
- Repetition

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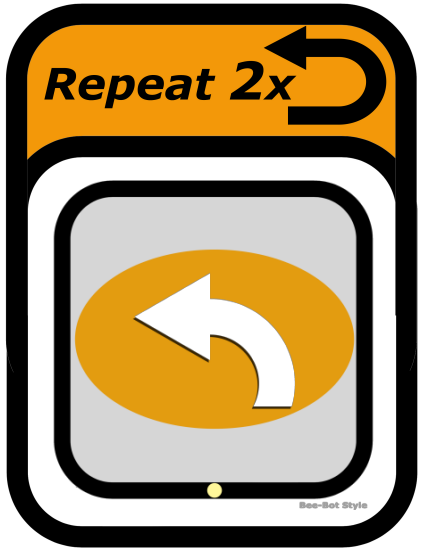
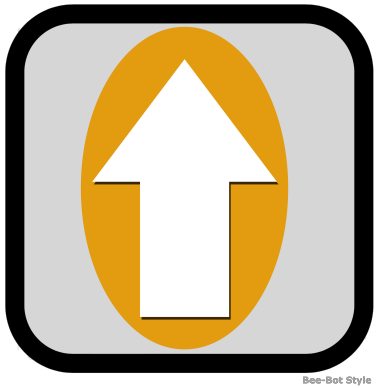
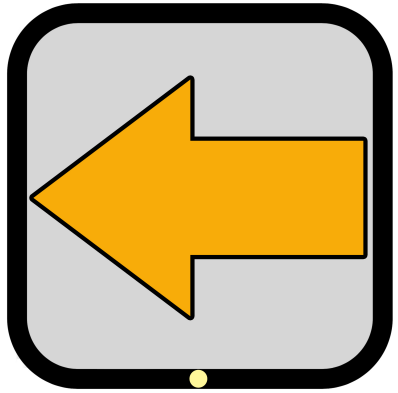
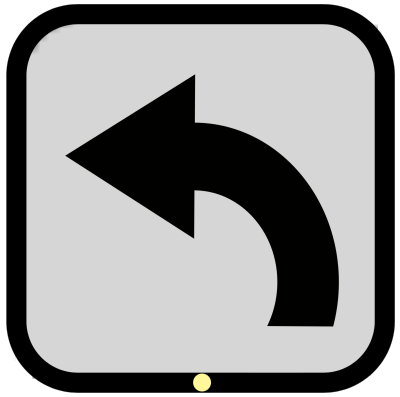
Coding Humans









BeeBot

- Directly Programmed
- Forward, back, right 90°, left 90°
- Go, Clear and Pause

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What elements of math did you see?

Beebot

- Sequence matters
- Shared notation
- Symbolic language
- Communication-based
- Distance
- Directionality
- Spatial Skills
- Numbers

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BeeBot Pirate Game

Working toward planning, creating "algorthms", efficiency, debugging and more.

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BeeBot

It is not always about solving a problem

It can be creating something new!

- https://safesha.re/maypole
- https://safesha.re/beebotdance

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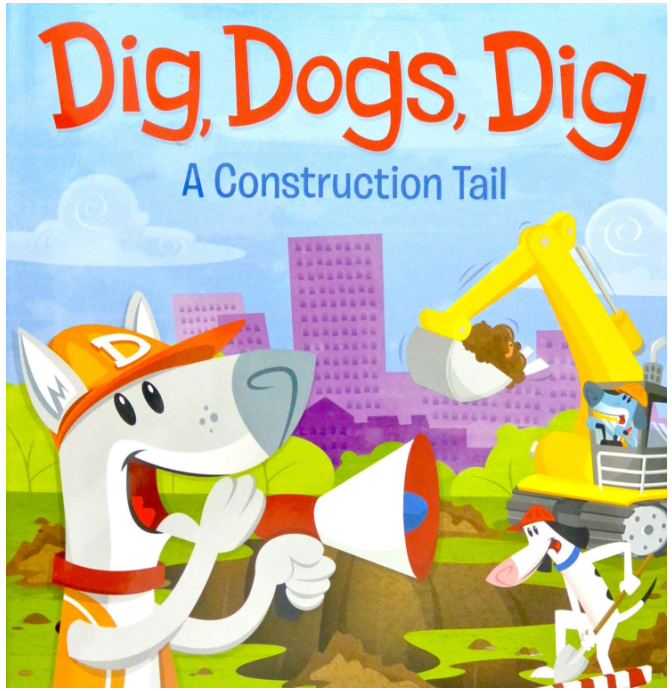
Mapping a Story

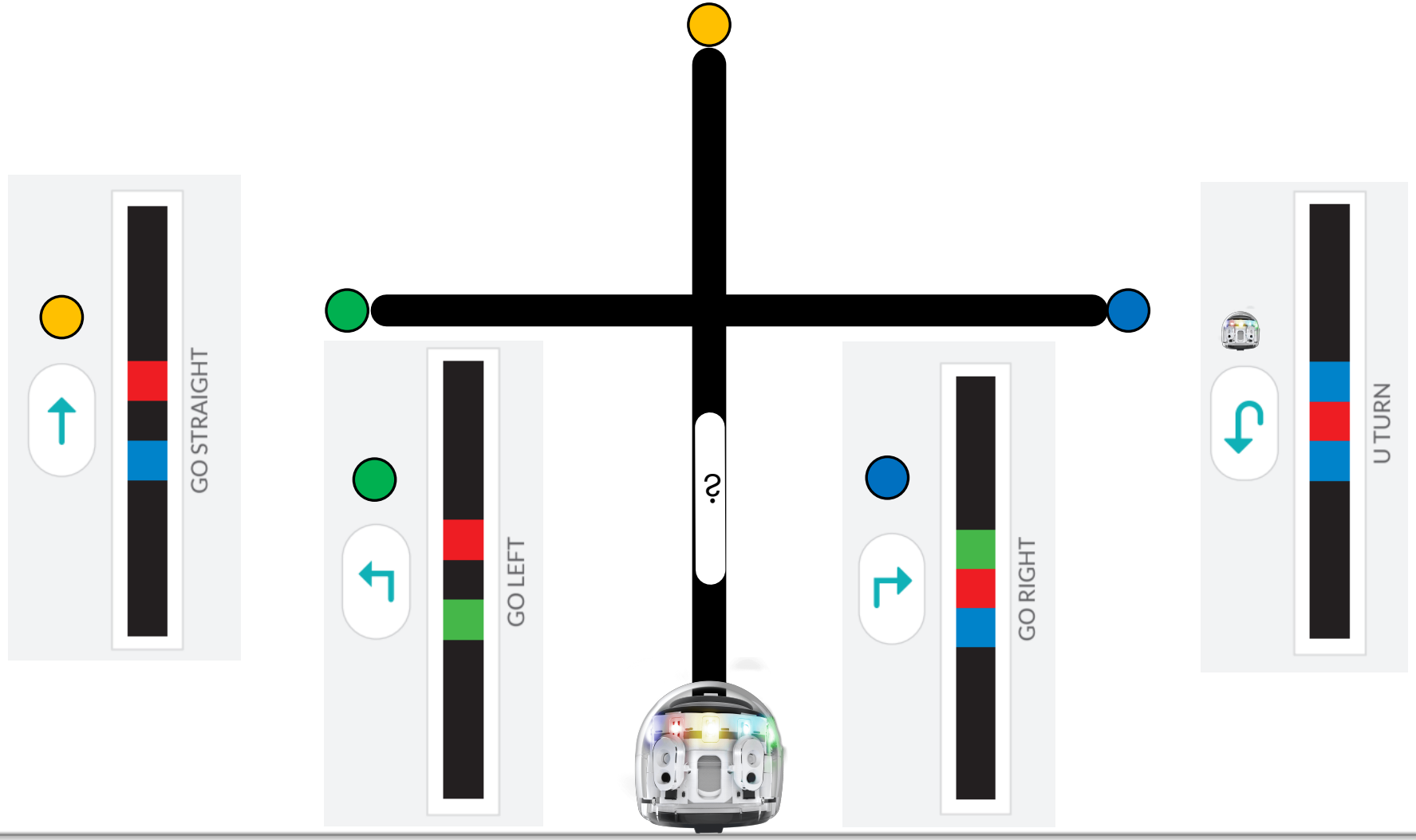


Thank you to Heidi Veal for sharing these images.

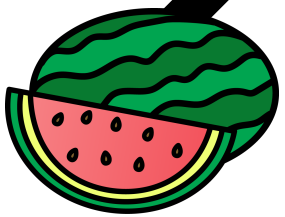
Coding without "Language"

Ozobot

Ozobot Turn Codes

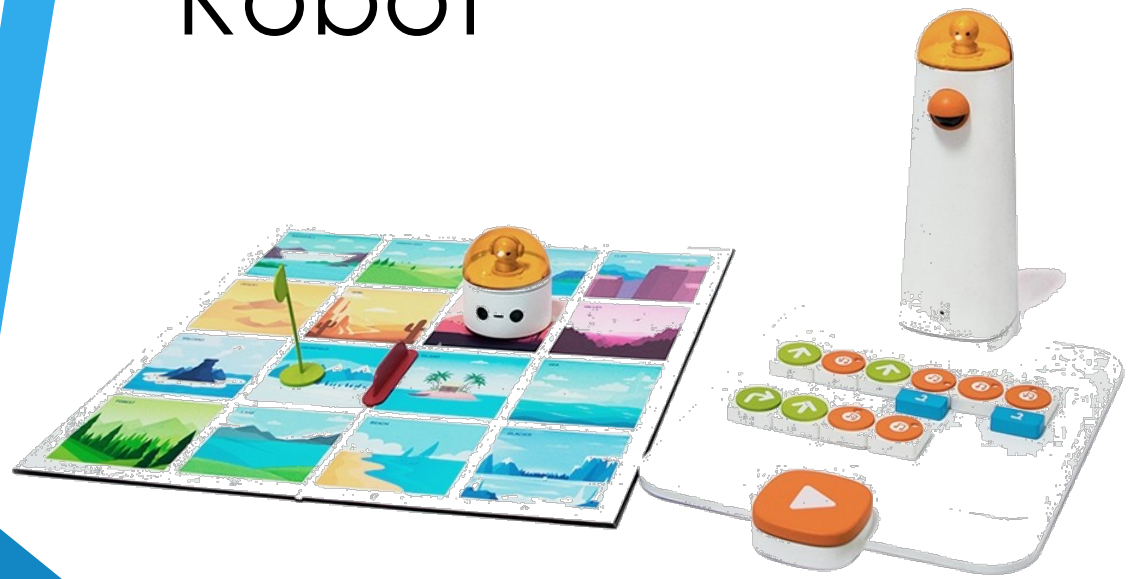


Circle where you choose to have Ozobot finish. Add turn codes to get Ozobot to your choice.



Coding, a Bit Less Direct

Matatalab Robot



Cubetto


Coding as a Playground
Programming and Computational Thinking in the Early Childhood Classroom
Marina Umaschi Bers
An Eye On Education Book
Look for playground opportunities over playpen uses...

Coding Apps and Sites

These can be too abstract or rote for littlest learners… but can be interesting for older learners… a few things to watch for…

Coding Apps and Sites

Playground or Playpen?

Only one "right way"?
Only goals established by the app

Stereotyping or other "issues"

Nancy Drew- Codes and Clues App – not actually coding, but…

Technology "mis-match"

Box Island has the "bot" move sideways

Coding Apps and Sites

Pay attention, play with, lean in, connect the app or site to real-world learning and experiences…be intentional.

Make intentional choices…

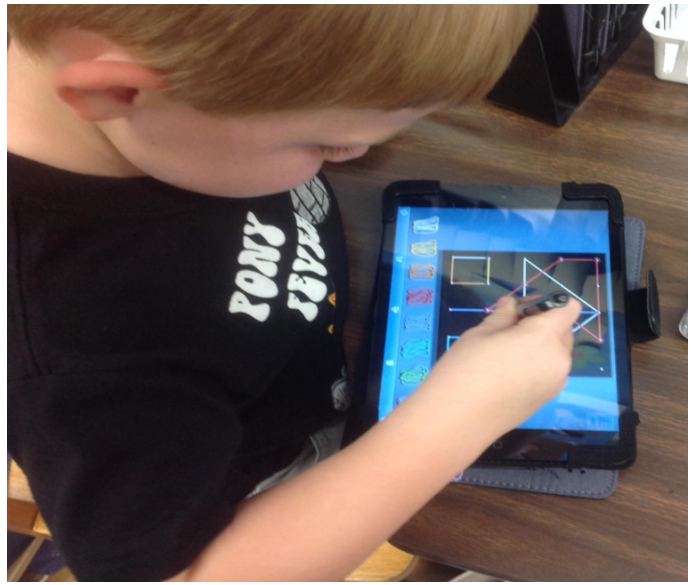
What do students need to learn, practice, explore?

Which kinds of thinking, problem solving, and other learning do they need to practice?

What do they want to do/try/create?

Which tools will help with that?

"false engagement"
"Wow Factor"
or deep thinking?



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Watch out for low-thought, high-engagement tasks as these can result in little longer-term benefits.

Spatial Reasoning

- In a longitudinal study, that followed children from the ages of 3 to 5, Farmer et al. (2013) found evidence to suggest that **children's spatial skills at 3 years of age were strong predictors of how well the same children performed in mathematics two years later, upon formal school entry.** Moreover, spatial skills were better predictors of later mathematics performance than vocabulary and even mathematics.
- Watts, Duncan, Siegler and Davis-Kean (2014) extended this thinking further by demonstrating that it is more specifically the shifts in misconceptions/gains in math thinking between age 2.5 and the end of grade 1 that was the best predictor of overall academic success, even more so than early reading/writing.
- http://bit.ly/spatialreasoning

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Coding with Little Learners is NOT about jobs...

Early Learning and curriculum is **supposed to be** about children's experiences in the world... technologies, robots and coding are an ever-growing part of our world, today and a growing part of their world tomorrow.

Coding with Little Learners is NOT about jobs...

"There are hundreds of reports out now about how automation will affect the future of work, what it means about how you need to teach your students. I disagree with all of them."

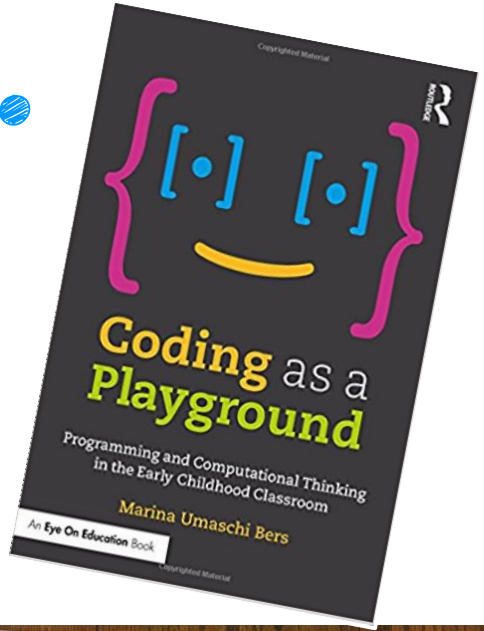
"Instead, Ming suggested that the educators and investors in the audience should not be focused solely on training students for potential coding and programming jobs—but on **equipping them to apply creativity and critical thinking to the tools and technologies today.** "Knowing how to program is not what makes someone a great programmer," she said. "**We need to build a society of explorers.**"

Vivienne Ming, a theoretical neuroscientist

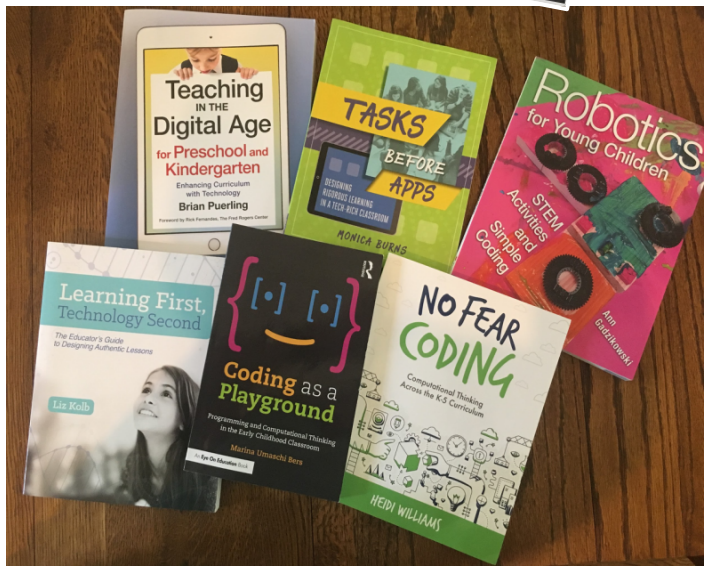
At NewSchools Venture Fund Summit May 2018

Corcoran, B., Abamu, J., & Johnson, S. (2018, May 14). Forward Failures, Future of Work and What's (Not) the Next Big Thing in Edtech. *EdSurge*. Retrieved May 14, 2018, from https://www.edsurge.com/news/2018-05-10-forward-failures-future-of-work-and-what-s-not-the-next-big-thing-in-edtech?

For Further Reading...



Coding as a Playground by Marina Umaschi Bers
No Fear Coding by Heidi Williams
Robotics for Young Children by Ann Gadzikowski
Learning First, Technology Second by Liz Kolb
Tasks Before Apps by Monica Burns
Teaching in the Digital Age for Preschool and Kindergarten by Brian Puerling



If you give a Mouse a Cookie by Laura Numeroff
If I were a Wizard by Paul Hamilton
My First Coding Book by Kiki Prottsman
Hello Ruby Adventures in Coding by Linda Liukas

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