



# Unplugged: Developing Early Elementary Coding Programs



Nicole McGee  
Rebekah Kreitner

# Let's give a hand to technology!

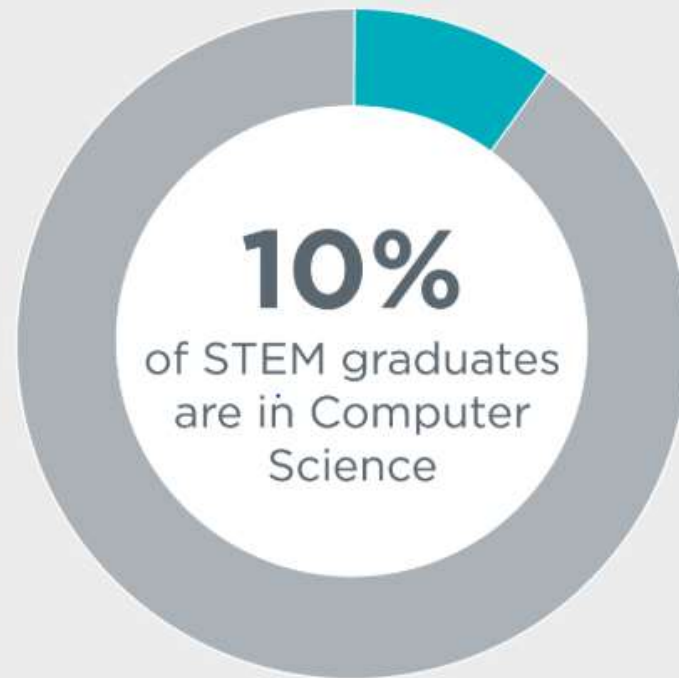
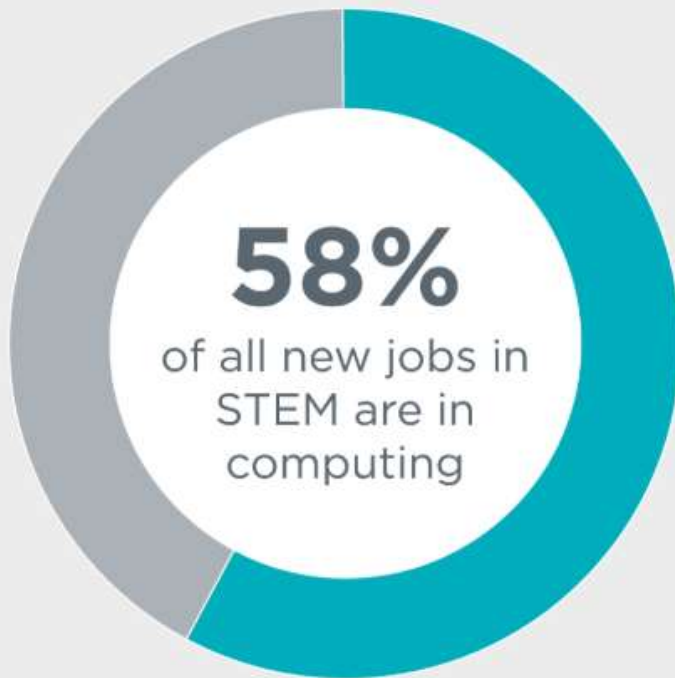
But pretend you are a machine and wait for your instructions!



Photo by [Anastasia Dulgier](#) on [Unsplash](#)

# Why Coding?

## The “STEM” problem is in computer science



# Why Coding?

**Computing jobs are the #1 source of new wages in the US**

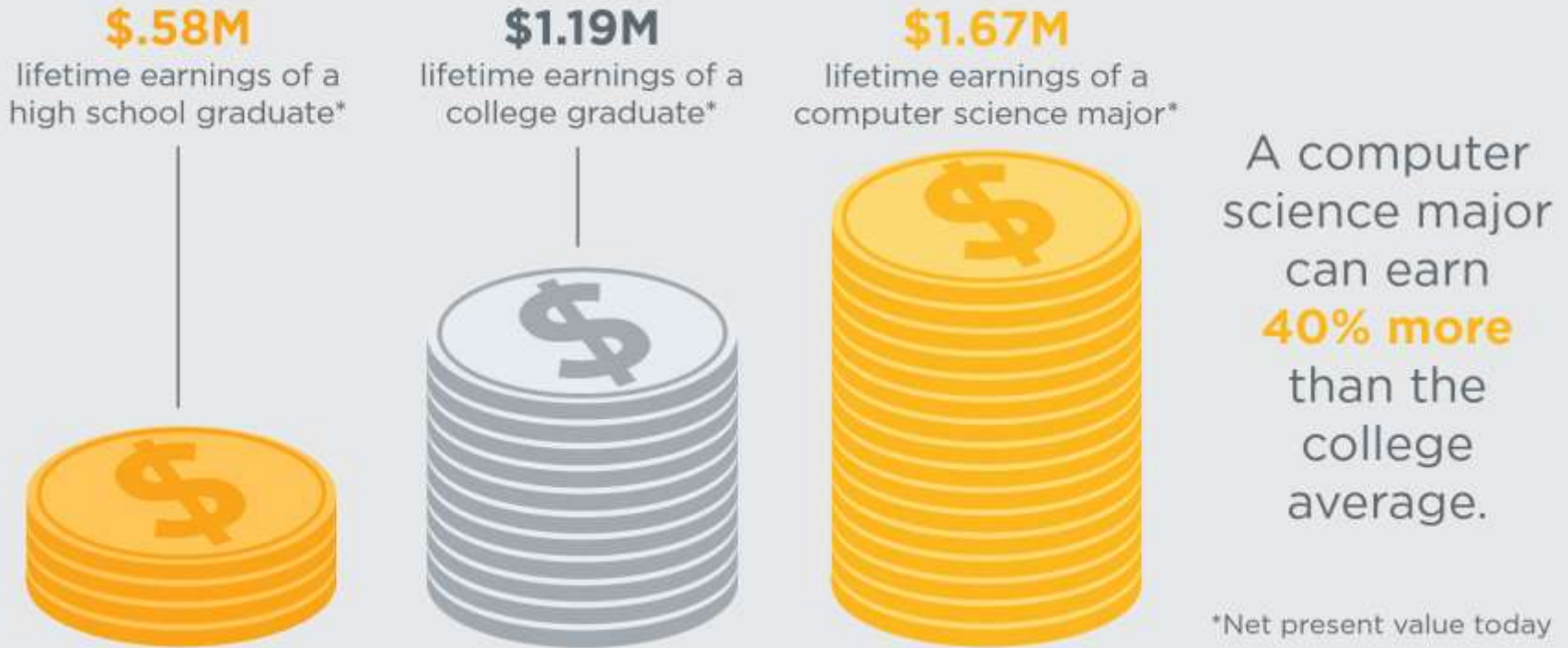
**500,000**  
current openings

These jobs are in every industry and every state, and they're projected to grow at twice the rate of all other jobs.



# Why Coding?

## The value of a computer science education



## Survey shows high demand for IT workers in region - Survey shows a high need for IT workers in Roanoke, New River valleys

*Roanoke Times, The (VA) - October 23, 2019*

- Author/Byline: Laurence Hammack laurence.hammack@roanoke.com 981-3239
- Edition: Metro
- Section: National
- Page: 6A
- Readability: >12 grade level (Lexile: 1420)

A recent survey of employers in the Roanoke and New River valleys showed a strong demand for people to fill new jobs in information technology.

More than 1,250 of the high-paying positions could be created within the next 18 months by about 40 companies, according to their responses to the anonymous survey conducted by the Valleys Innovation Council, a nonprofit organization that works to support regional economic growth.

"We've been hearing for some time now that regional employers have a growing, unmet need for IT and software talent," said Doug Juanarena, co-chair of the council.

Organizers hope the survey will underscore the importance of working with employers, support organizations and communities to come up with strategies to develop and recruit the needed talent.

"Almost no business today can grow and scale without IT and software development talent," Juanarena said.



# Why Coding in Libraries?

## The state of K-12 computer science standards

Only 34 states have created K-12 computer science standards.

Momentum is building, but we still have a long way to go.



# Project Goals

- Introduce children in K-2 to foundational coding concepts and skills.
- Provide easy access to developmentally-appropriate coding toys at each branch, focusing on locations in high-need areas.
- Reinforce 21<sup>st</sup> Century skills such as persistence, collaboration, problem-solving and creativity.
- Model for parents prompts and activities that can be done at home to extend learning.



# Timeline

- January 2018
  - Submit Virginia Beach Library Foundation grant request
- Summer 2018
  - Purchase equipment and supplies
- Fall 2018
  - Package and catalog equipment
  - Develop program plans
  - Train programming staff
- January 2019
  - Offer first classes using equipment

# Budget – Awarded: \$23,050

Actual Expenses:

\$11,275 – Cubetto

\$10,150 – KIBO

\$1,248 – ROOT

\$297 – Supplies

TOTAL: \$22,970

# Program Development



# Common Program Elements

- Common definitions for coding terms
- Assessment of skills and experience at beginning
- Direct instruction, guided practice, independent practice, open play
- Quick comprehension checks throughout



Meet Cubetto







**Cubetto Scavenger Hunt** 

Tell Cubetto how to find these places on the map. 

Name \_\_\_\_\_







# Meet KIBO



# Results

- 40 programs during 2019
- Staff are comfortable with the equipment and concepts as evidenced by the development of new programs based on initial set of program plans.
- Easy, on-site access means:
  - Coding toys are being integrated into existing youth STEAM series.
  - Staff are incorporating coding toys and concepts as opportunities arise – outreach at local childcare centers are being piloted now.

# Staff Observations

- Children learn foundational coding & critical thinking skills such as:
  - Directionals – right, left, up, down
  - Sequencing & prediction – putting steps in right order to complete a task
  - Vocabulary – algorithm, program

# Staff Observations

- The Bonuses – other important skills are practiced & developed
  - Self-control
  - Social/emotional skills
    - Collaborative work
    - Alternate perceptions
  - Creativity

# Staff Observations

- Parents
  - Learn the importance of coding in the future workforce
  - Ways they can encourage foundational skills at home
  - Become comfortable & self confident around technology

# Lessons Learned

- Equipment
  - Pairing
  - Directionality especially in relation to commands & robot; which way is the robot facing?
  - Batteries and screwdriver
- Space considerations
- Program Prep
- Range of skills and experience



# Unplugged Activities on any budget

- Essential components
  - Decomposing large task into smaller tasks
  - Ordering tasks into correct sequence
  - Fixing problems – debugging
- What you can do
  - Tasks -How to make PB&J, brush teeth, get dressed
  - Navigation – how to get from point A to point B
- Sample materials

# My Robotic Friends

**Steps:**

1. Choose one "Robot" per team.
2. Send robot to "Robot Library" while the "programmers" code.
3. Choose one image from the Cup Stack Pack for each group.
4. Groups will create an algorithm for how the robot should build the selected stack.
5. Coders will translate their algorithm to arrows, as described in Symbol Key.
6. When programmers have finished coding their stack they can retrieve their robot.
7. Upon return, the robot reads the symbols from the cards and translates them back in to movements.
8. The group should watch for incorrect movements, then work together to debug their program before asking the robot to re-run it.

**Rules:**

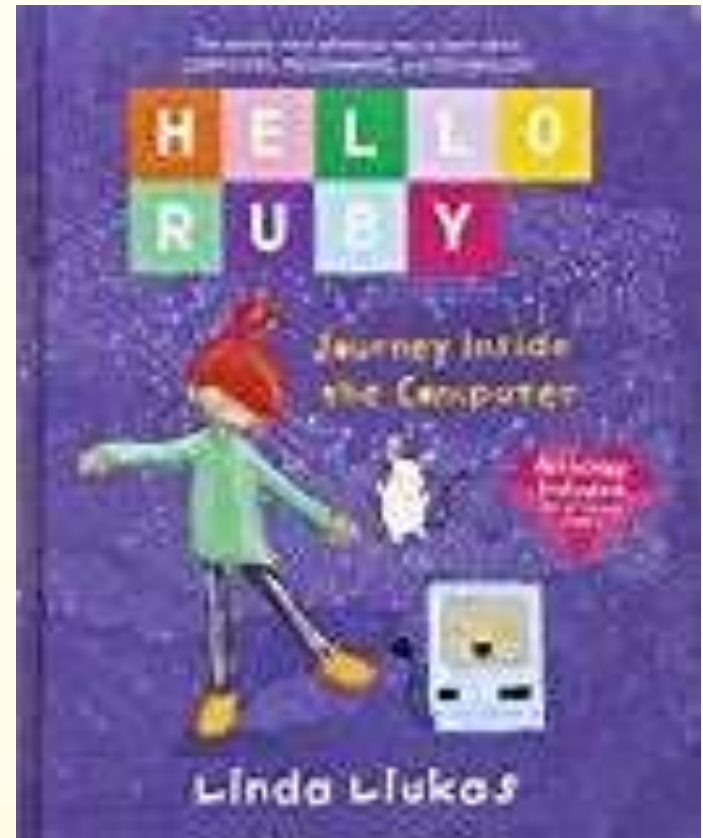
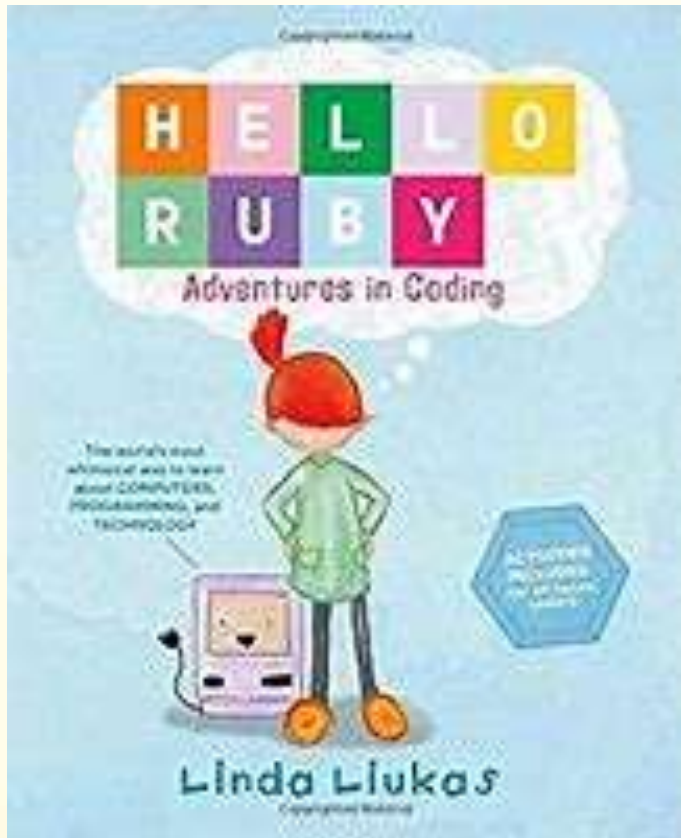
1. Coders should translate all moves using *only* the six arrows suggested.
2. Cups should remain with the robot, not provided to programmers during coding.
3. Once robots are back with their groups, there should be no talking out loud.

*If your student asks about rules that haven't been defined above, you can either define them according to your exercise, or ask them to define that rule within their own group.*



“My Robotic Friends,”  
[https://csedweek.org/files/CSED\\_robotics.pdf](https://csedweek.org/files/CSED_robotics.pdf), Thinkersmith,  
2013. Licensed under CC BY-NC-SA.

# DIY Coding



<http://www.helloruby.com>

# Resources

- Websites

- Cubetto: <https://www.primotoys.com>
- KIBO: <https://kinderlabrobotics.com/kibo/>
- Coding:
  - [www.code.org](http://www.code.org)
  - [www.hourofcode.com](http://www.hourofcode.com)
  - <https://www.tynker.com>
  - <https://code.org/curriculum/unplugged>
  - <https://www.csunplugged.org/en/>
  - <http://www.helloruby.com>
  - <https://www.naeyc.org/resources/pubs/tyc/feb2017/creating-coding-stories-and-games>

- Books – specific to coding or concepts being covered

# Thank You!

Nicole McGee – [nmcgee@vbgov.com](mailto:nmcgee@vbgov.com)

Rebekah Kreitner – [rkreitne@vbgov.com](mailto:rkreitne@vbgov.com)