Robotics for Young Children: Ask KIBO

Presenters:

Madhu Govind, Emily Relkin, Angela de Mik, Jennifer Butts, Ebyn Brinkley, Jennifer Paniczko
Agenda

8:15-8:30  Introductions
8:30-9:15  Intro to DevTech, Coding as a Playground, and KIBO
9:15-10:00 Hands-on KIBO play: Program the Wild Rumpus
10:00-10:15 Refreshments Break
10:15-10:45 Intro to Coding as Literacy (CAL) and Preliminary Research Findings
10:45-11:20 Educator Panel: Ms. Angela de Mik, Ms. Butts, Ms. Brinkley, Ms. Paniczko
11:20-11:30 Wrap-Up
Let's Get to Know Each Other!
Emily Relkin, M.A.

- **Ph.D. Student**, DevTech Research Group at Tufts University

- **Expertise**: Coding, Technology, and Computational Thinking Assessment in Early Childhood

- **Recent Publications**: *A Pilot Study of the KIBO Robot in Children with Severe ASD (2018); Assessing Young Children’s Computational Thinking Abilities (2018)*
Angela R. de Mik, M.S.

- **Grant Project Director, Operation:** Breaking the Code to College and Career Readiness DoDEA Grant (5-year, $1.5 million dollar grant for 8 NPS grant schools)

- **Expertise:** Doctoral coursework in special education and educational leadership, grant writing, and early childhood education

Jennifer Butts

- 2nd Grade Classroom Teacher, Sewells Point Elementary
- B.A. History, Virginia State University
- 9 years of teaching experience (Grades K-3)
- Interests: coding for younger students as a way to see strengths in all students
Ebyn Brinkley

- 2nd Grade Classroom Teacher, Sewells Point Elementary

- Interests: family, teaching, traveling, movies, and learning new things
Jennifer Paniczko

- **2nd Grade Classroom Teacher,** Granby Elementary

- **B.S. Elementary Education and Social Science**

- **Teaching experience:** First Grade Spanish Enrichment at Dual Language elementary school. Currently teach specialized inclusion program

- **Areas of interest:** family coding in elementary education, Responsive Classroom and Positive Behavior Intervention and Support
Madhu Govind, M.A.

- **Ph.D. Student** in the Dept. of Child Study & Human Development
- **Graduate Researcher**, DevTech Research Group
- **Areas of interest**: family coding in early childhood, K-2 coding and robotics education, positive technological development
Prof. Marina Umaschi Bers, Ph.D.

- **Professor and Chair** of the Dept. of Child Study & Human Development and Adjunct Professor, Dept. of Computer Science at Tufts University

- **Program Director**, Early Childhood Technology Certificate Program

- **Director**, DevTech Research Group

- **Expertise**: STEM, educational technology to support positive youth development, the impact of technology on social and moral development
DevTech Research Group at Tufts University

Mission Statement:
The DevTech Research Group at Tufts University aims to understand how new technologies can play a positive role in children's development and learning.
Session Objectives

● Identify the professional development strategies to promote coding and computational thinking in early childhood education.

● Explore the KIBO student curriculum and the teacher-preparation professional development curriculum.

● Experience first-hand how the KIBO system works and is integrated into pre-K through second grade curriculum.
Two scenarios for playful learning

Playpen

Playground
Many technologies are playpens
Our choice:
Four Dimensions of Our Work

Theoretical contributions
Empirical research
Designing new technologies
Community outreach
Hands-On Activity: Meet KIBO
KIBO Hardware

KIBO robot with wheels and motors

Input/output modules
(distance, sound, and light sensors, lightbulb, sound recorder)

Expression module

Stage art platform

Rotating art stage with motor
KIBO Software

21 programming blocks

12 parameter cards
KIBO is in use in over 60 countries
What is a Repeat Loop?

Repeat and End Repeat are like the bread of a sandwich. The programming blocks put inside of them are like the filling. KIBO will only repeat commands that are placed inside of the Repeat Loop sandwich. Segments of the code placed outside of the sandwich will not be repeated.
Complex KIBO Rules: Repeat Loops

KIBO will repeat whatever is **between** and

Tell KIBO **how many times** to repeat something using **number parameters**

...or tell KIBO **when to stop with sensor parameters**:
What are IF Statements?

IF blocks allow KIBO to make choices based on what it can sense, just like your students can! Use the LIGHT, DARK, NEAR and FAR parameters with IF blocks. Remember to attach the appropriate sensors!
Complex KIBO Rules: If Statements

KIBO can also decide what it should do based on sensor input by using the conditional IF command and

Use sensor parameters to modify the IF statement

KIBO will do whatever is between the If and End If block, if the sensor parameter statement is true.
A KIBO Coding Curriculum for Readers
Integrated with Foundational Literacy Topics

Using the KIBO robotics kit and Coding as Literacy (CAL) approach developed by

DevTech Research Group
Eliot-Pearson Dept. of Child Study and Human Development
Tufts University

CAL Reader Curriculum:
https://sites.tufts.edu/codingasliteracy/curriculum/
Time to Try It!

Write your own version of a Wild Rumpus and make your story come to life using KIBO!

Use the Lesson 11 and Lesson 12 pages from your Design Journal to help you plan and record your story designs!
Share KIBO Projects
Coding as a Literacy (CAL)

As educators, we must give children one of the most powerful tools for thinking: language… both natural and artificial languages

The CAL approach proposes that programming, as a literacy of the 21st century, engages new ways of thinking, communicating, problem solving, and working with others.

- Bers, 2019 (in press)
Example from the classroom

We have a new student coming. He doesn't know anything about magnets. Use Kibo to teach him what you have learned about magnets.
Learning through Iterative Processes

WRITING PROCESS

EDIT  
REVISE  
PUBLISH  
PREWRITE  
DRAFT  
PLAN

DESIGN PROCESS

CREATE  
ASK  
IMAGINE  
TEST & IMPROVE  
SHARE  
PLAN
Some Powerful Ideas of Computer Science & Literacy

- Design Process
- Representation
- Algorithms
- Debugging
- Control Structures
- Writing Process
- Spelling-Sound Correspondence
- Sequencing, Story Structure
- Editing, Awareness of Audience
- Cause and Effect, Making Predictions
The Norfolk CAL Project

**Goal:** To determine whether educating children to code impacts standard measures of literacy as well as computational thinking abilities

**Student Cohort:**
- Eight Norfolk Public School schools
- Second Graders (ages 6-8)
- ~600 students receiving CAL, ~200 controls

**Duration:** 3 months

**Primary Outcomes:** Computational Thinking, Literacy skills, Educator feedback

**Secondary Outcomes:** Programming knowledge, Student Perceptions
Preliminary Research Findings
EFFECT OF CAL CURRICULUM ON COMPUTATIONAL THINKING SKILLS

Tech Check Assessment

Data from Norfolk Study, one school (4 classes) Tech Check Scale 0-15, significance levels determined by Student’s T-Test
Virtual and in-person support resources allow for learning beyond the 1-day PD.
## Teacher Perceptions

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<th>CAL Pedagogy</th>
<th>Use of support resources</th>
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<td><strong>RESISTANT</strong> “The writing here is not as structured and formalized... I thought those standard sections were a bit of a stretch”</td>
<td><strong>LOW</strong> &quot;If we needed support from our ITRT person, she'd always come in... but I was pretty comfortable and confident in my abilities to implement the lessons”</td>
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<td><strong>NEUTRAL</strong> “They definitely used more sequence words but I didn’t see it in their writing samples,... I just wished there’s more of a transferring skill”</td>
<td><strong>MEDIUM</strong> “We had Ms. D coming in all the time, you all sending in the emails and having the check-ins to see how we felt, our team being able to get together if we needed to…”</td>
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<td><strong>RECEPTIVE</strong> “The main things I've noticed improvements with is details... and making sure that you're saying everything that you want to say so that someone will understand”</td>
<td><strong>HIGH</strong> “[our IT person and the para] conducted the lessons with the children and I would sit in and a lot of times, watch them...they were the day-to-day pillars of the program”</td>
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CAL Panel
CAL Panel

Angela R. de Mik

Jennifer Butts

Ebyn Brinkley

Jennifer Paniczko
KIBO Resources

DevTech Research Group:  http://sites.tufts.edu/devtech/research/kibo-robot/

KinderLab Robotics:  http://kinderlabrobotics.com/

KIBO Resources Page:  http://resources.kinderlabrobotics.com/
https://sites.tufts.edu/codingasliteracy/

12 one-hour lessons

Video tutorials for each lesson

Embedded writing activities & coding assessments
Sign up for the e-list to stay updated on current DevTech work!
Bit.ly/devteche-list
Tufts Early Childhood Technology (ECT) Graduate Certificate Program

- For Educators and practitioners working with young children
- 2 required online courses + 1 week residency at Tufts
- Hands on experience teaching the KIBO robot, ScratchJr and other technologies at the Eliot Pearson Children’s School
- [www.go.tufts.edu/ect](http://www.go.tufts.edu/ect)
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**Project Coordinator**
Angela de Mik

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