STEAM Robotics for Children Four to Seven+

Agenda

Company Overview

What is KIBO

Curriculum + PD

Show and Tell

Questions

Company Overview: Meet KIBO

KIBO is a robotic kit for 4+ year-olds to build, program, decorate, and bring their own robot to life!

- Mission: Universal STEAM Literacy
- Method: Fun, educational STEAM platform for early childhood
- Benefits: Skills and confidence in STEAM thinking and collaboration

KinderLab robotics

Why We Do What We Do

KinderLab robotics

STEAM Literacy: A Problem that Matters

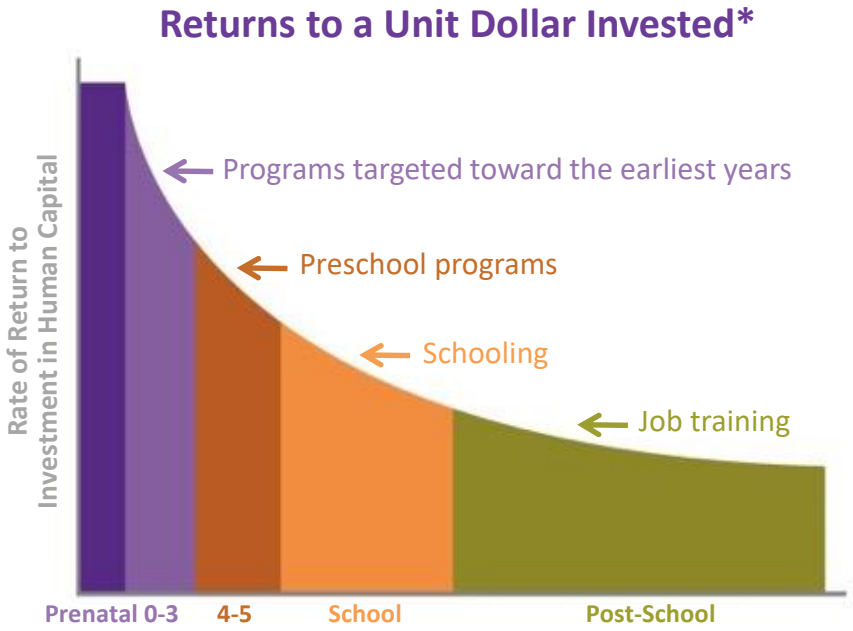
Demand for STEAM education is growing

- Increased STEAM requirements for both STEAM and non-STEAM jobs
- Competitiveness: US students 27th in math
- Achievement gaps: gender, race, economic

Early childhood is the right time to introduce STEAM, but most solutions focus on older kids

- Developmental: 33% drop in interest by 4th grade
- Economic: J. Heckman, Nobel Prize

Most elementary school teachers not prepared to teach STEM



*Source: Heckman, James J. (2008). "Schools, Skills and Synapses," Economic Inquiry, 46(3): 289-324

KinderLab robotics

Societal Impact for STEAM Solutions

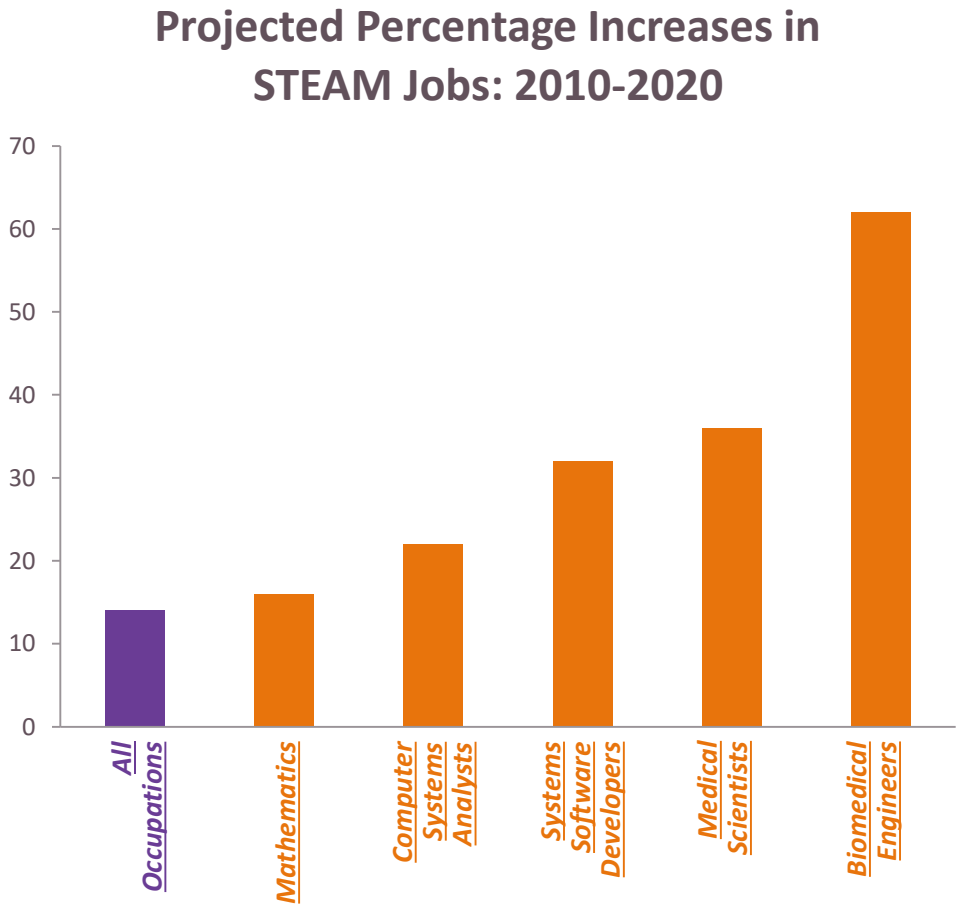
Reduce achievement gap

- Reduce gender, racial, and economic inequalities of STEAM literacy
- Increased STEAM literacy impacts both STEAM and non-STEAM jobs

More STEAM-literate citizenry make better civic decisions

- Health, technology, economic, security, environment, etc.

Improve economic competitiveness of country



KIBO is…

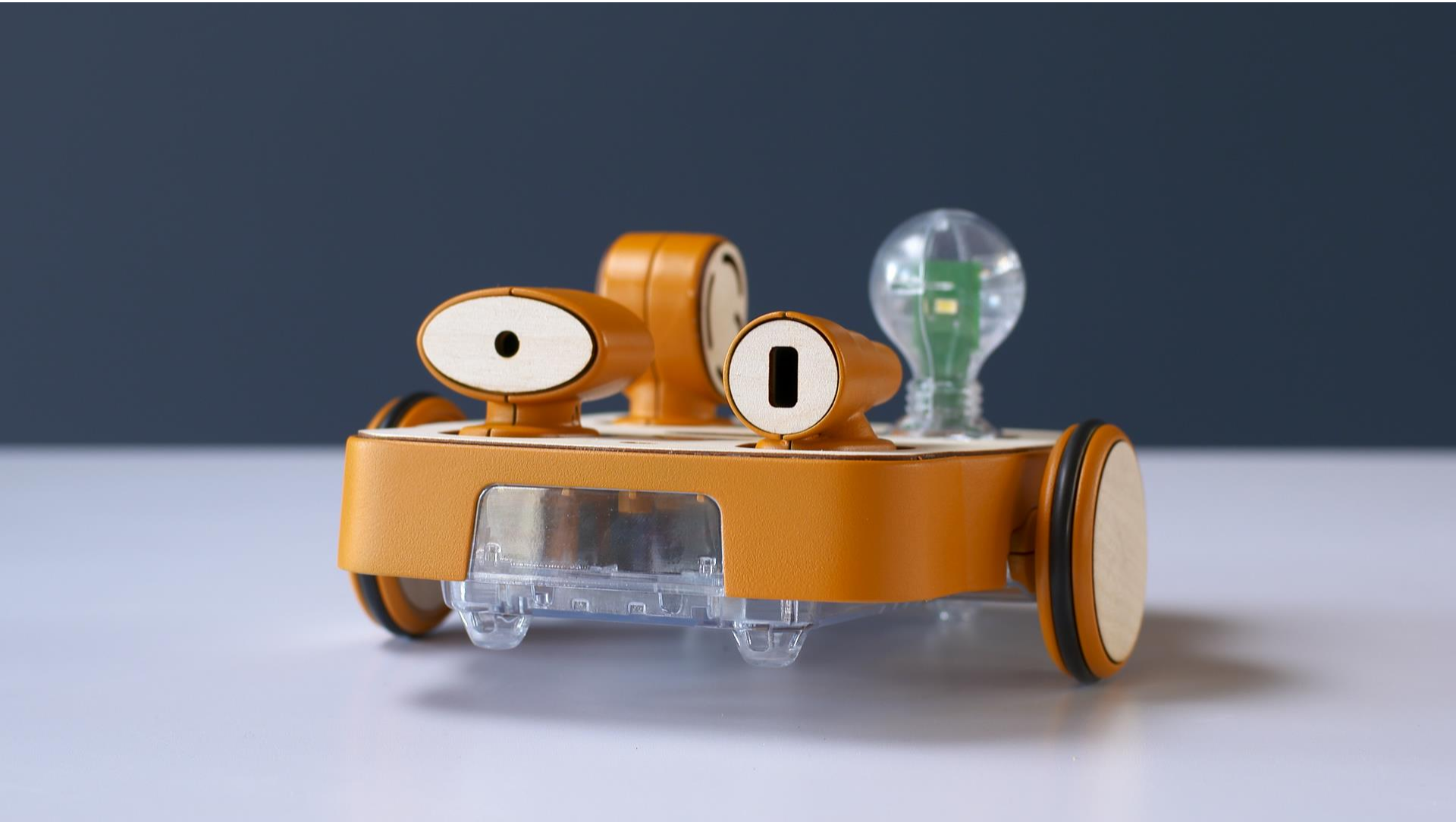
Based on **20 years** of academic and field research at Tufts University and elsewhere

Physical, not virtual: lots of movement and no screens suit developmental needs of 4-7 year olds

Designed for open-ended expressive play integrating **STE(A)M** concepts

Easy to **integrate** into school curricula

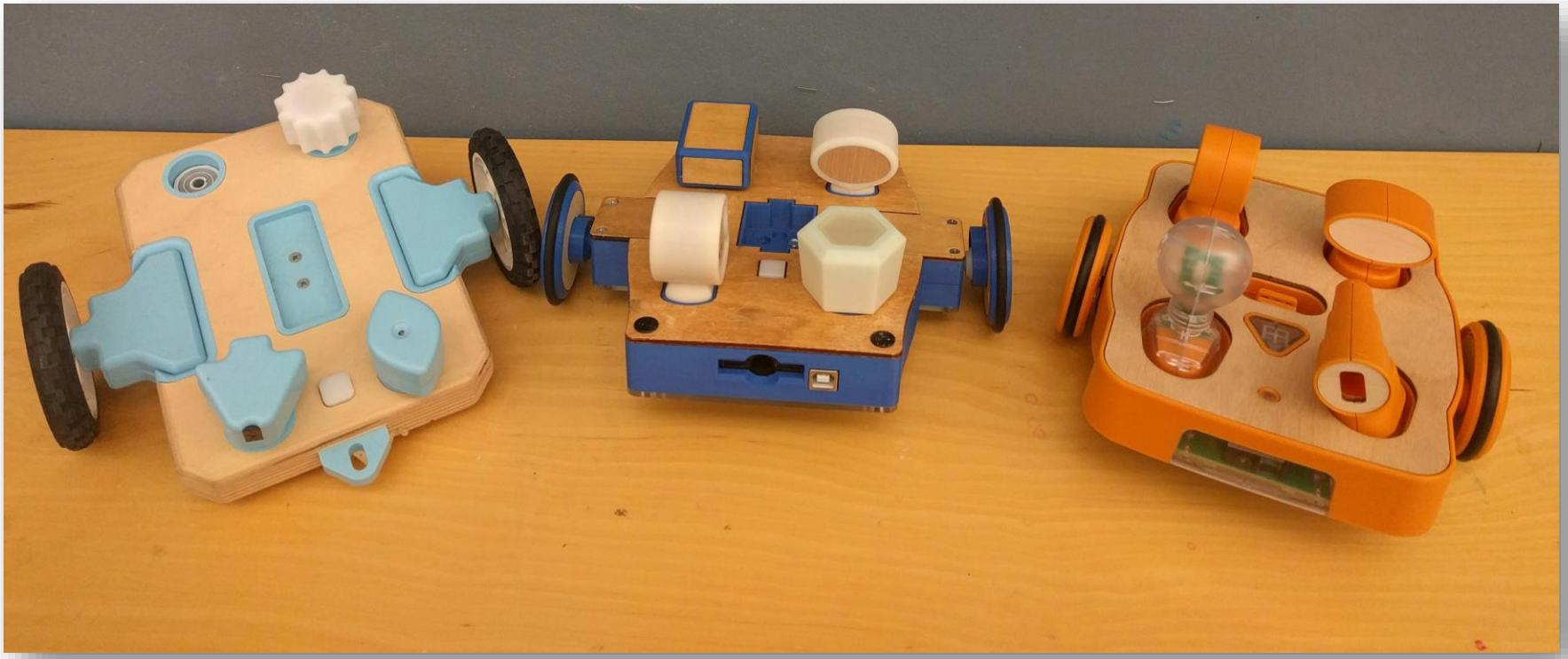
KinderLab robotics



Building Blocks and Parameters

KinderLab robotics

About Us and Our History



KinderLab robotics

Meet the Team: Our Founders

Professor Marina Umaschi Bers, Chief Science Officer

- Professor of Child Development at Tufts (PhD MIT)
- TED talk and 5 books about STEAM in early childhood
- **http://ase.tufts.edu/devtech/**

Mitch Rosenberg, CEO

- Executive, marketing, product management, sales, operations experience at 6 venture-backed firms, including Kiva Systems, Rethink Robotics, PictureTel, Automatix
- MSEE MIT, MBA Boston University

KinderLab robotics

Professor Marina Umaschi Bers

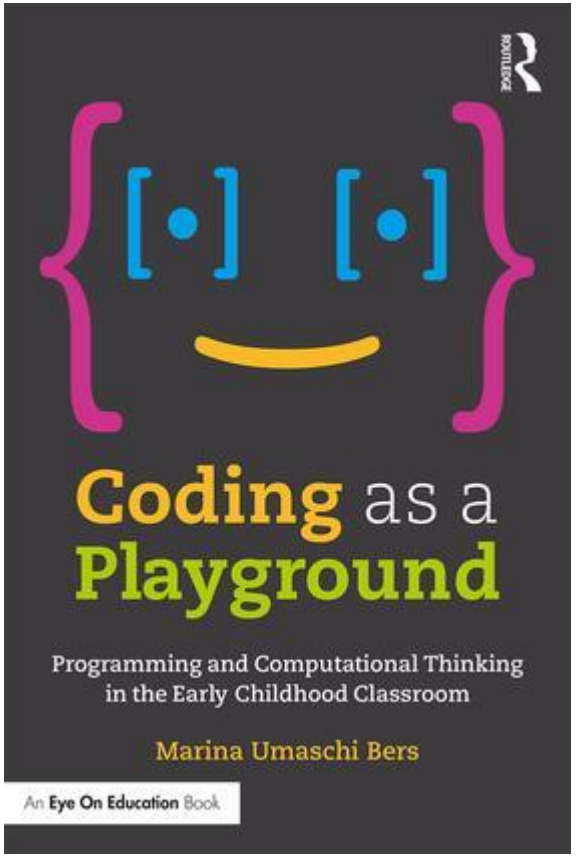
- KinderLab Chief Scientist
- Professor of Child Development and Computer Science at Tufts University, where she heads the DevTech research group
- Led research behind KIBO and co-developed Scratch Jr.

KinderLab robotics

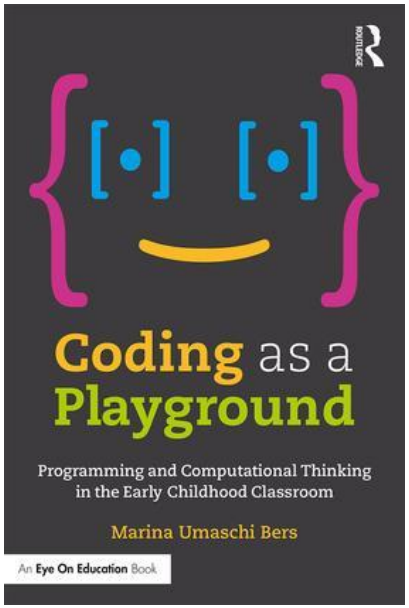
Research is Our Backbone

"*Researchers and practitioners have long relied on Bers' deep understanding of early childhood computer science education and turned to her vision for the future of the field for inspiration and guidance. Her ideas have influenced my own philosophy of education, including the work at Code.org. In Coding as a Playground, Bers consolidates her ideas into practical recommendations that any CS education advocate can apply.*"

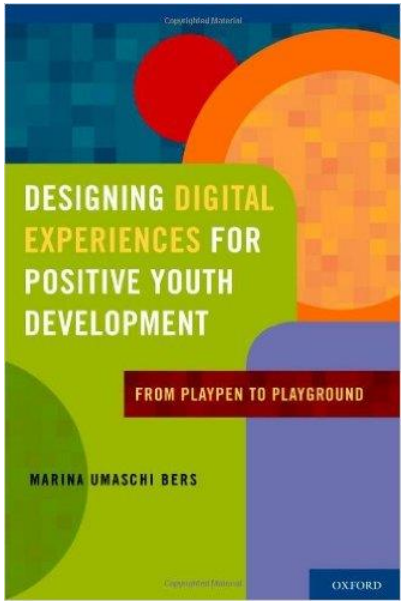
Pat Yongpradit,
Chief Academic Officer,
Code.org



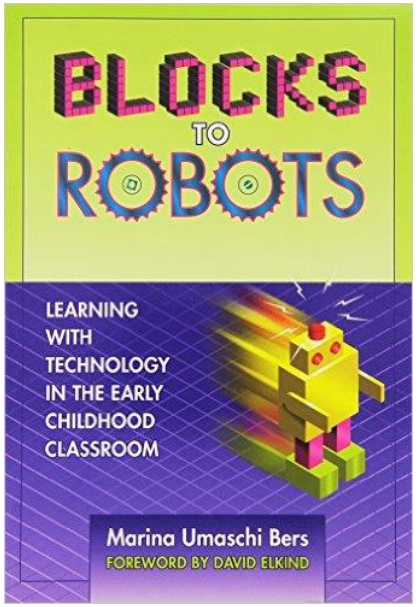
Dr. Bers' Research



Coding as a Playground (2017)



Designing Digital Experiences for Positive Youth Development (2012)



Blocks to Robots (2007)

Additional Papers and research can be found at www.kinderlabrobotics.com/research-articles

KinderLab robotics

KIBO: STEAM Made Tangible and Playful

Efficacy Proven in over 20 years of research and Kid-Tested

- Skills: 62% Improvement in sequencing skills in Kindergarten
- Attitudes: 85% increase in girls' agreement with "Enjoy being engineer"
- Success in both public and private schools, plus libraries, museums, after-school programs, and camps

KinderLab robotics

Corporate Milestones

- Founded as C-Corp in May 2013
  - Based on previous NSF research grants to Tufts University
- Kickstarter 2014: $80,000
- NSF/SBIR Grant Funded: Phase I, Phase IB, Phase II
- Social Impact Forum Accelerator 2016
- Singapore Playmaker Program: buys $240,000 of KIBOs – https://www.youtube.com/watch?v=2ltLPPtA1BY
- Global media coverage

Forbes

The Economist

The New York Times

npr

KinderLab robotics

A Trusted Partner

- Trends
  - Total Customers: 1,800 customers with over 6,000 kits
  - New Customers: Average of 30 new customers per month
  - Enterprise Customers: 100+ customer sites with over 10 kits
- R&D: Continuous product and curriculum extensions
  - Examples: KIBO 21 jumped to 10% of units, 65 LEGO Extensions sold in first 30 days
  - New products contributed 25% of revenue growth

KinderLab robotics

Why Coding for 4-7 Year Olds?

- Children engage with technology as **active producers** rather than passive consumers
- Expand children's **self-image** as comfortable with technology and engineering
- "Make coding the playground."

-Bers, M. (2012). Designing Digital Experiences for Positive Youth Development: From Playpen to Playground. Cary, NC: Oxford.

KinderLab robotics

Computational Thinking

KIBO fosters seven “powerful ideas” of computational thinking described by Bers (2017):

1) Algorithms
2) Modularity
3) Control Structures
4) Representation
5) Hardware/Software
6) The Design Process
7) Debugging

KinderLab robotics

Computational Thinking + Child Development

Computational Thinking Skill	Child Development Skills and Attributes
Algorithms	Sequencing / logical order (foundational math + literacy skill)
Modularity	Breaking a large job up Writing (and following) instructions
Control Structures	Recognizing patterns Cause and effect
Representation	Symbolic representations (e.g. writing)
Hardware / Software	Recognizing that technology is not "magic" Recognizing objects that are human-made
Design Process	Problem solving, perseverance Editing and revision (as in writing)
Debugging	Identifying problems / checking your work "Grit"

Bers, M.U., (2018). Coding as a playground: Programming and computational thinking in the early childhood classroom. New York, NY: Routledge press

KinderLab robotics

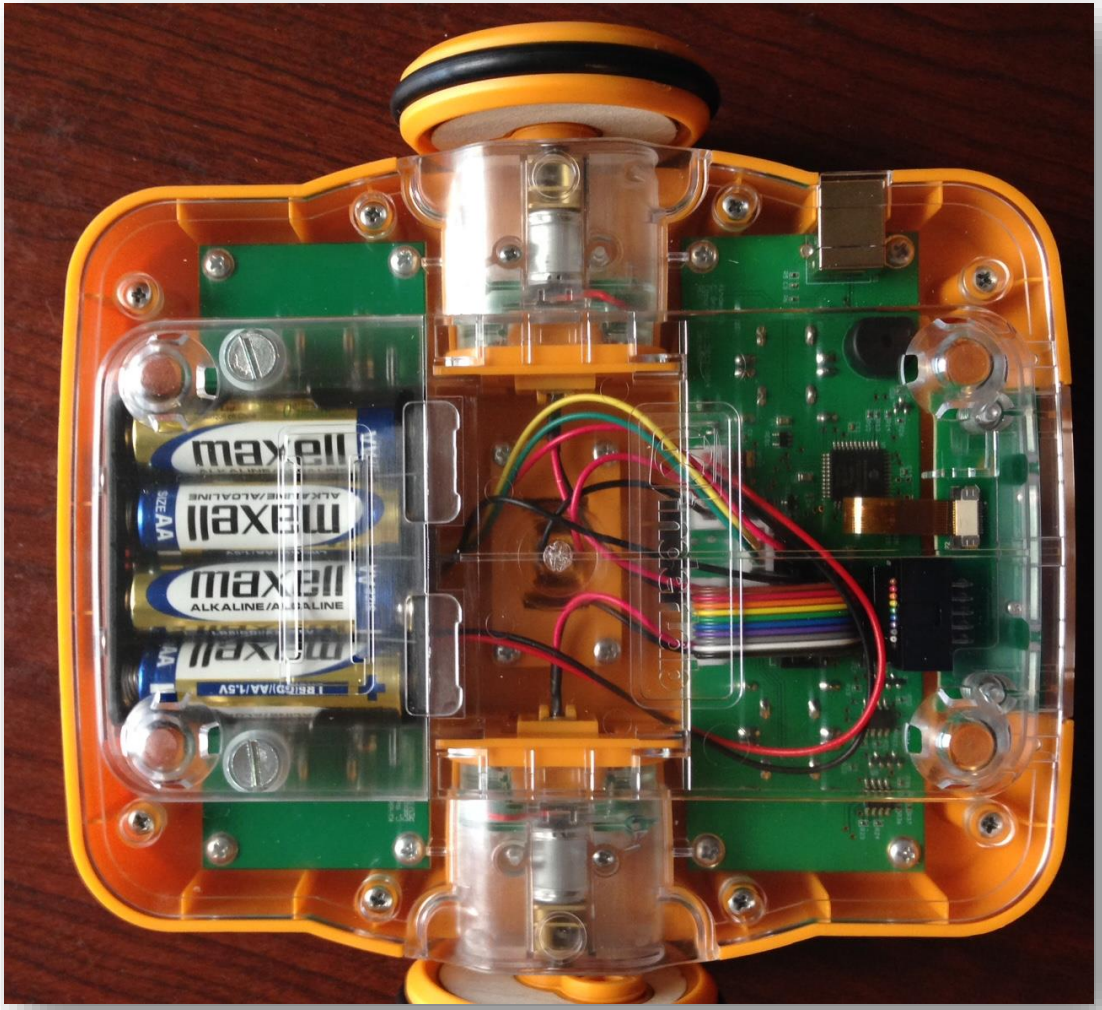
Why (KIBO) Robotics?

- Young children learn by:
  - Moving, doing, and making (Piaget, Papert)
  - Experimenting, playing, and collaborating (Vygotsky)

- KIBO is **screen free** and gets kids **moving**
  - Learning reinforced by movement
- Block-based programming is **tangible**

KinderLab robotics

Parts, Not Magic



KinderLab robotics

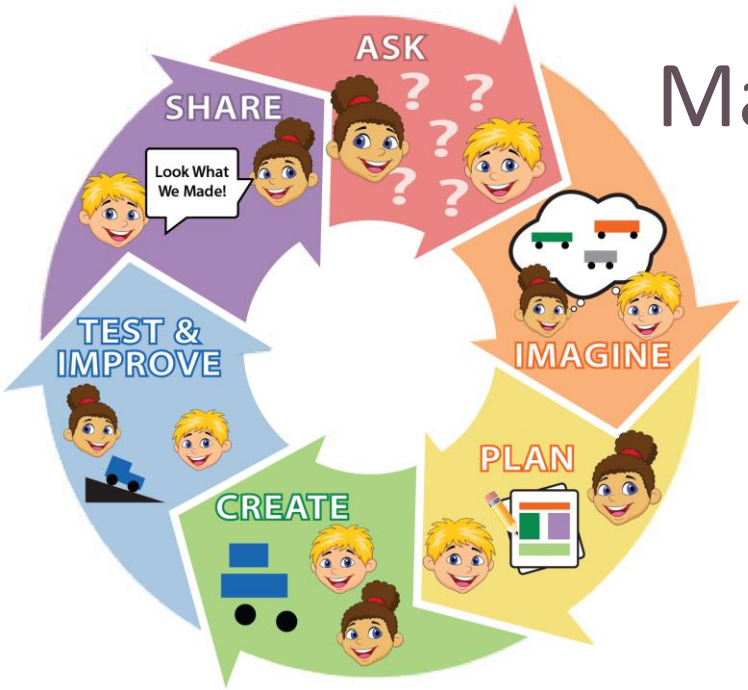
From S.T.E.M…

Science,

Technology,

Engineering,

Mathematics



KinderLab robotics

To S.T.E.A.M.

Science,

Technology,

Engineering,

Arts,

Mathematics

- The ease of building and decorating KIBO allows teachers to implement KIBO successfully to support diverse STEAM curricula (Sullivan, Strawhacker, Bers 2017)

KinderLab robotics

KIBO: STEAM Literacy for Pre-K – 2nd Grade

Designed to be age-appropriate

- Tangible and kinetic learning, not abstract
- Creative, open-ended, fun

Introduces key STEAM principles with proven efficacy

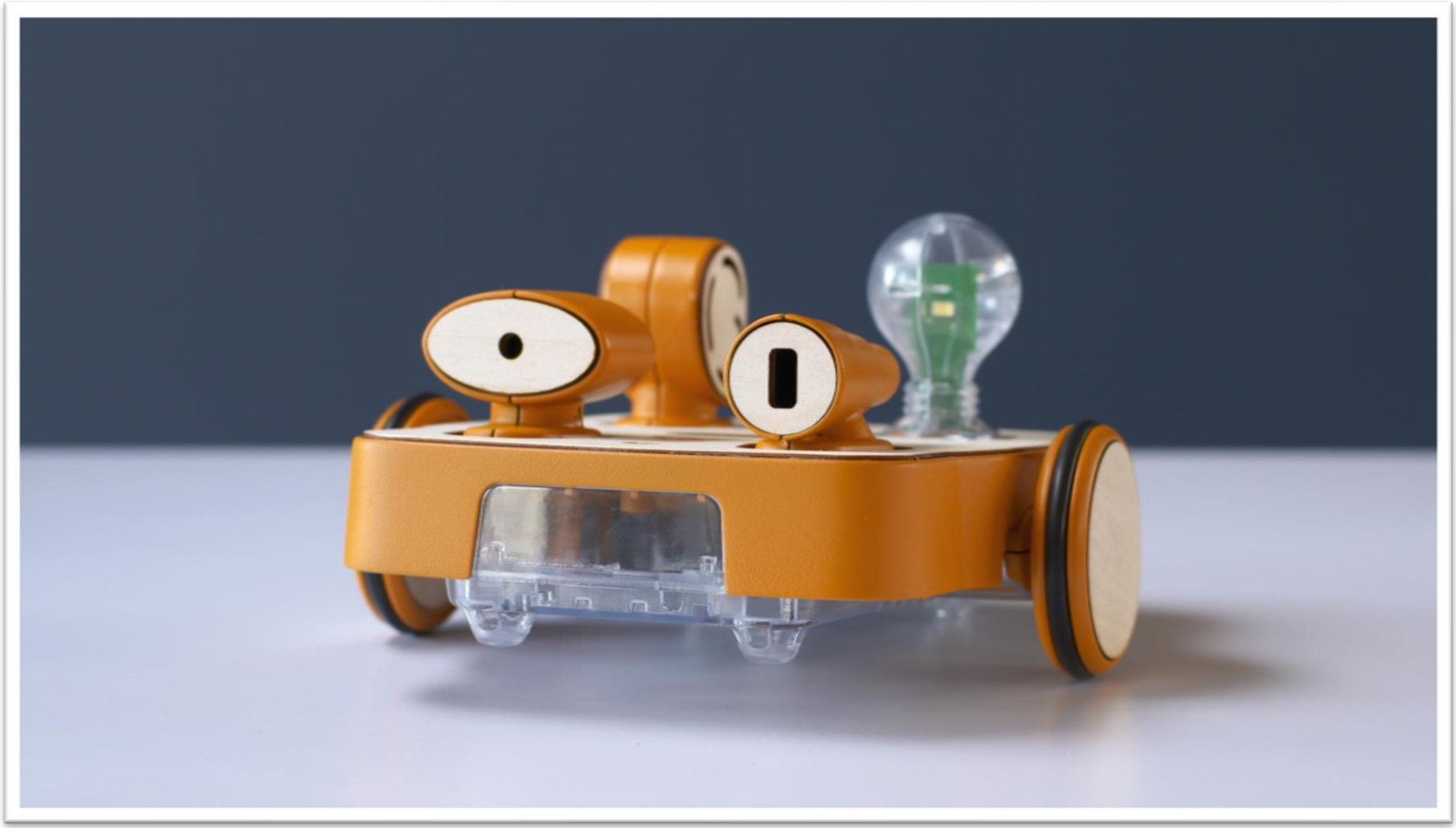
- Coding, sequencing, building, sensors, variables
- Meta-principles: problem solving, collaboration, integration with other disciplines
- Developed from over 20 years of research in Early Childhood STEAM literacy

Easy for educators

- Integrates into curriculum standards
- Teacher support materials and curriculum
- No PC or IT support required

KinderLab robotics

What is KIBO?

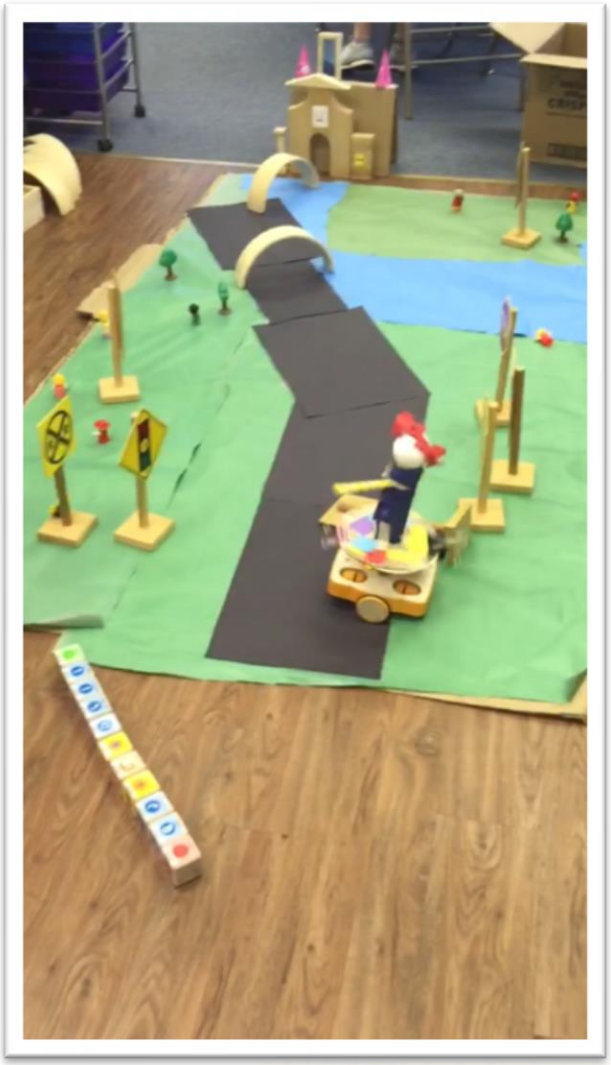


KinderLab robotics

KIBO is… a Dancer

KinderLab robotics

KIBO is… an Imaginary Car



KinderLab robotics

KIBO is… a Butterfly in its Habitat

KinderLab robotics

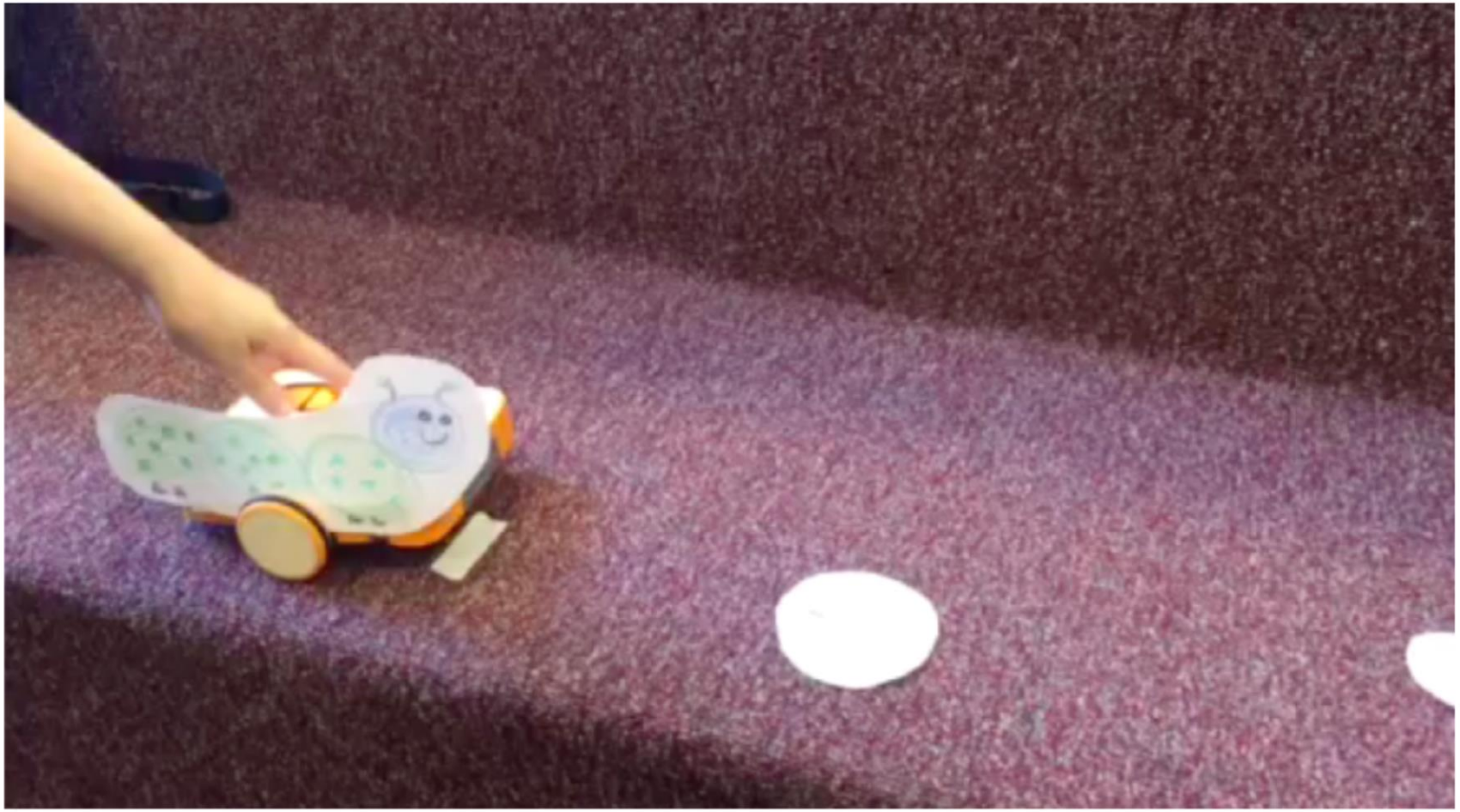
KIBO is… a Cave Explorer

KinderLab robotics

KIBO is… a Bowling Ball

KinderLab robotics

KIBO is… a (Very) Hungry Caterpillar



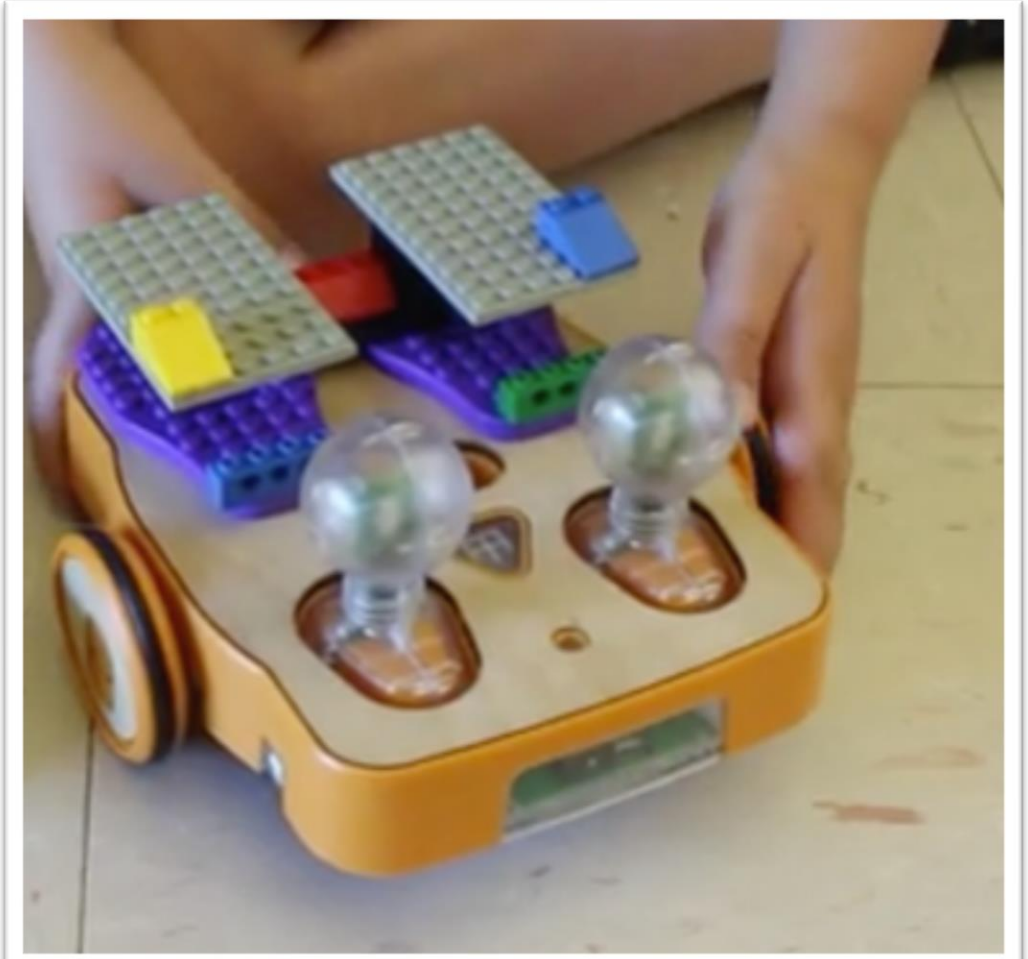
KinderLab robotics

KIBO is… “not-Blue” Jay

KIBO is… Goin' On a Bear Hunt

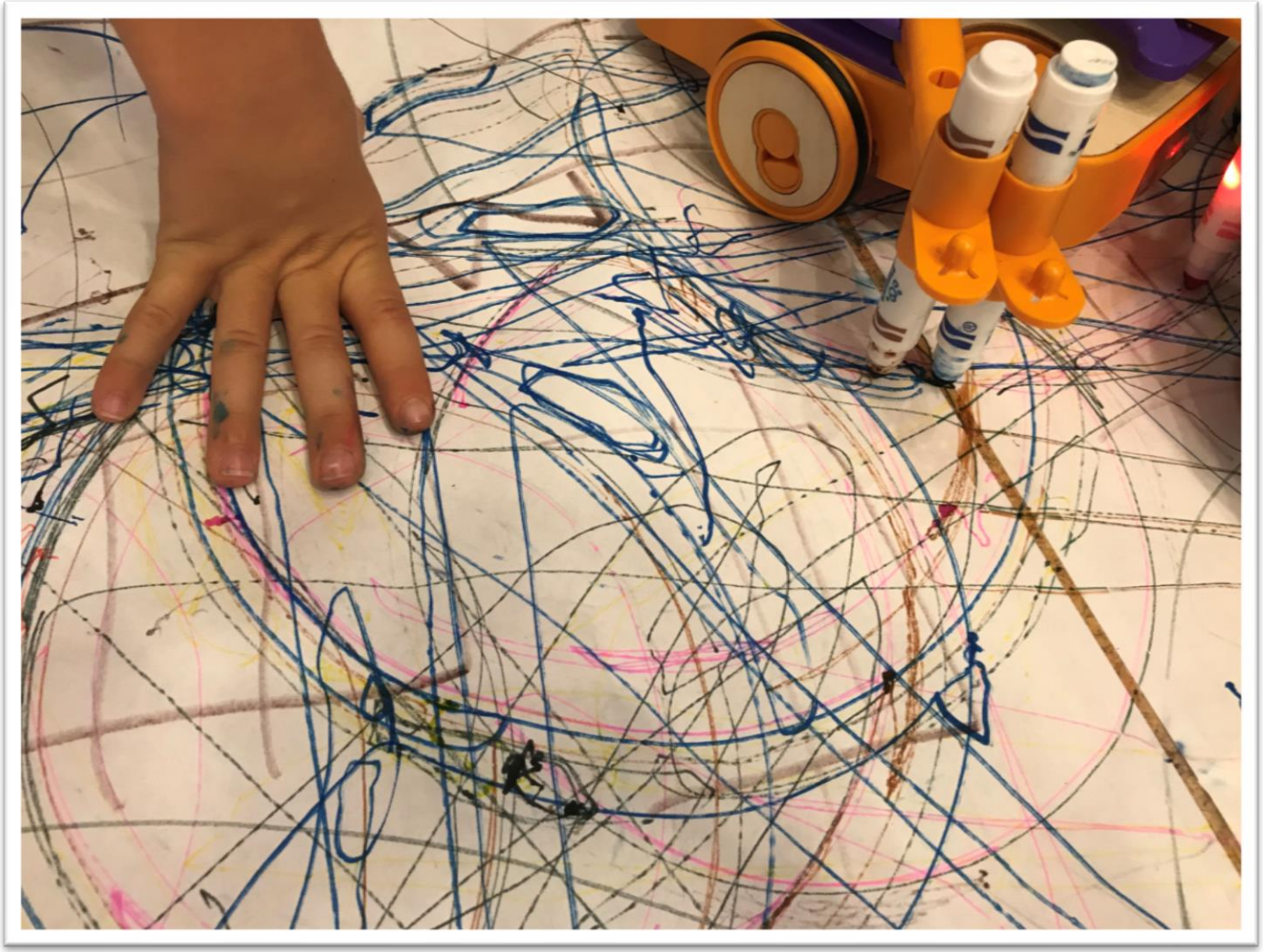
KinderLab robotics

KIBO is… an Interactive Sculpture



KinderLab robotics

KIBO is… an Artist



KinderLab robotics

Creative Play and Expression

KinderLab robotics

KIBO is all of this…

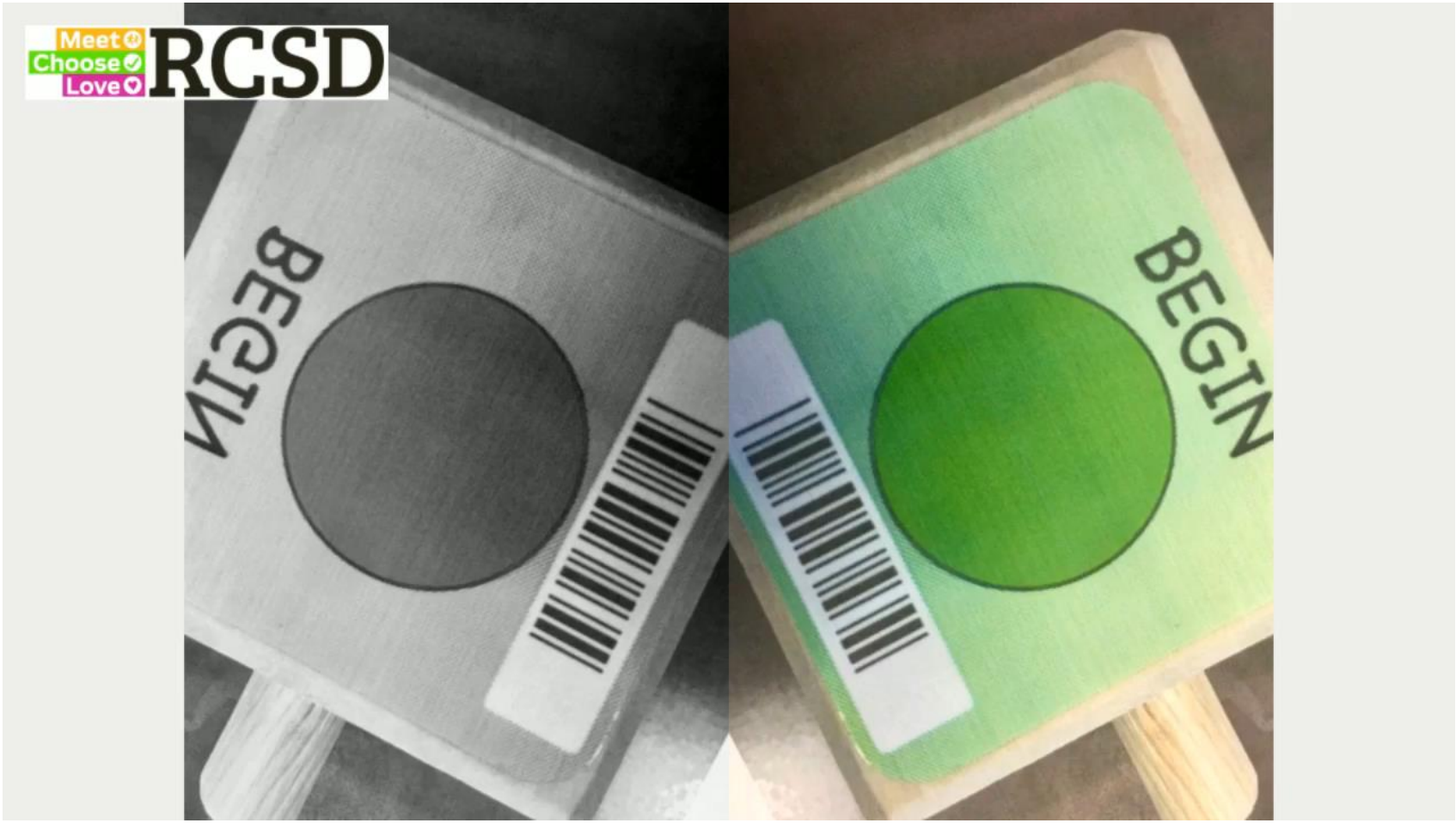
…because **KIBO** is anything children imagine.

KIBO is a robot kit that lets 4-7 year olds **build**, **decorate** and **code** their imagined creations.

KinderLab robotics

KinderLab robotics

Coding with John Gill Elementary School



Going on a Bear Hunt with KIBO

KinderLab robotics

KIBO Assembly and Scanning

https://youtu.be/MeWAaSTQE5c

KinderLab robotics

STEAM Literacy with KIBO

KinderLab robotics

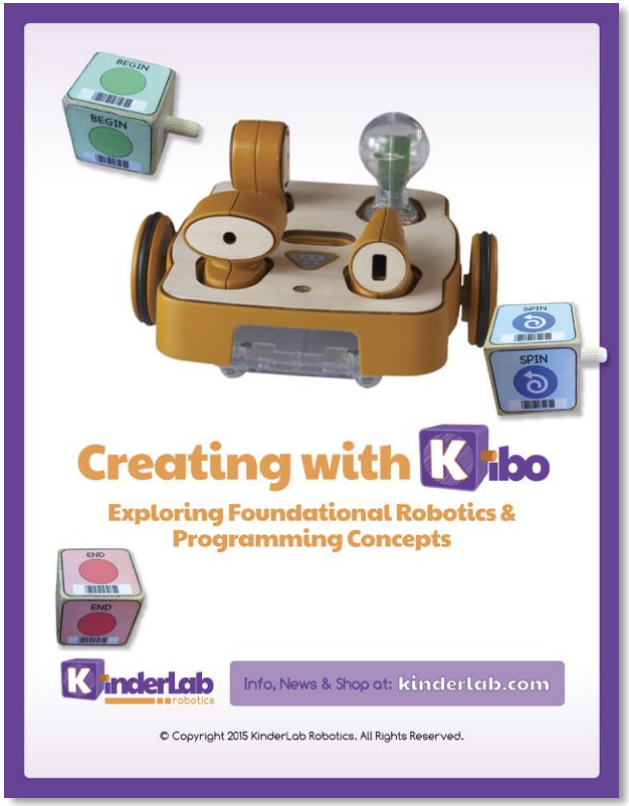
KIBO Curriculum Philosophy

Working with KIBO involves:

- Computational thinking (Programming)
- The Engineering Design Process (Building)
- Integration component (Curricular Theme)

KinderLab robotics

KIBO Curriculum Guide



- *Creating with KIBO* is the core curriculum from KinderLab
- Provides 20-40 hours of instruction, divided into 1-2 hour lessons
- Can be integrated with a wide range of subjects

KinderLab robotics

KIBO Curriculum Lesson Plans

Lesson	Main Activity and Objective
Lesson 1: Sturdy Building	The students will create models out of craft and recycled materials, then they will test the sturdiness of their models by dropping them from ankle height, then revising them to make them stronger. Students learn about: The Engineering Design Process
Lesson 2: What is a Robot?	Children share and learn ideas about what robots are. They are introduced to KIBO robotics concepts. Children will then think creatively in order to design, build, and test their own "dream car" robotic vehicles. Students learn about: Robots and their parts
Lesson 3: Hokey Pokey	Children choose the appropriate instructions and learn the importance of sequence as they program their robots to dance the Hokey Pokey. Students learn about: Programming KIBO
Lesson 4: What are Repeats?	Students will learn about new programming blocks that make the robot repeat other instructions. They use these new blocks to program robot vehicles to "drive around the block" by repeating commands. Students learn about: "Repeat" and loops

KinderLab robotics

KIBO Curriculum Lesson Plans (cont.)

Lesson	Main Activity and Objective
Lesson 5: What are Sensors? (Part 1)	The KIBO robots will use sound sensors and the Wait For Clap block to sing and dance to the "If You're Happy and You Know It" song. Students learn about: Robotic sensors, the KIBO Sound Sensor
Lesson 6: What are Sensors? (Part 2)	KIBO robots will run in the Robot Olympics! In this activity, each robot will run one leg of a relay race and use a distance sensor or light sensor to stop when their part of the race is done and it reaches its teammate. Students learn about: KIBO Distance and Light Sensors
Lesson 7: What are "Ifs"?	Robots do different activities based on the state of a light sensor. On a map on the floor, robots drive to school if it is light and back home if it is dark. Students learn about: "If" and branching
Lesson 8: Final Project	Students work together to build and program a KIBO robot to demonstrate their understandings and ideas related to the robotics and programming curriculum as well as the content of the project theme or topic. A final showcase or demonstration inviting friends and family and school community members is strongly encouraged!

KinderLab robotics

Learning through Play: KIBO Says

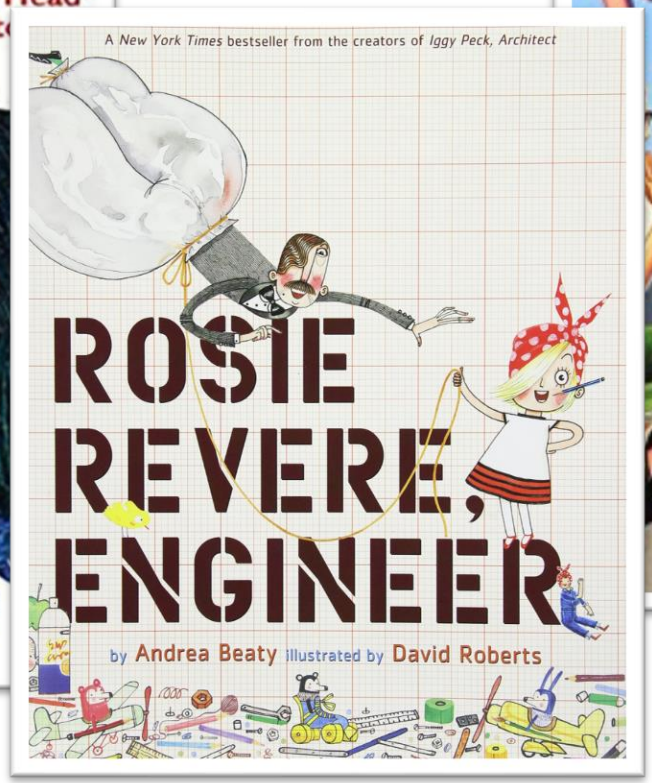
- "KIBO Says" Game

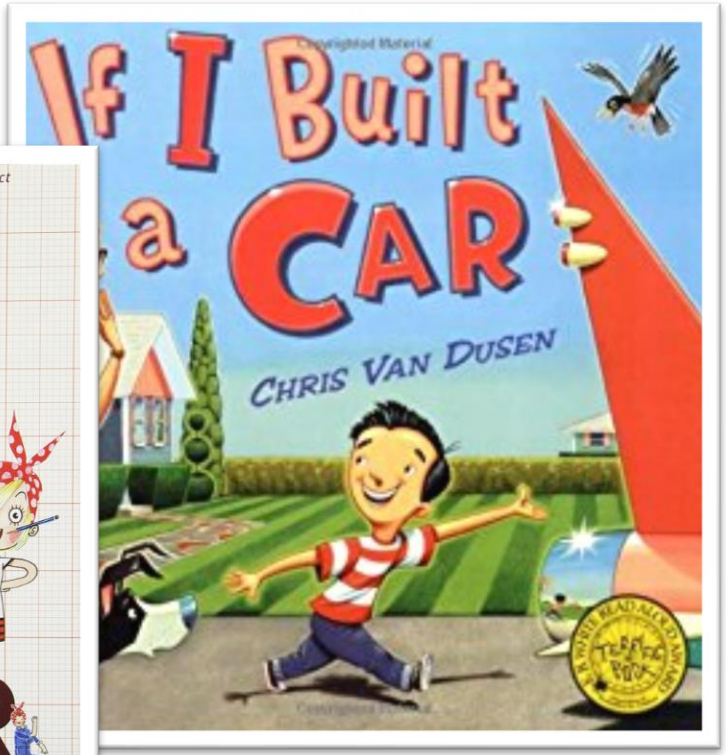
Introduce KIBO commands through active play.

KinderLab robotics

Contextualization

Activities introduced with age-appropriate books, familiar routines, favorite activities.

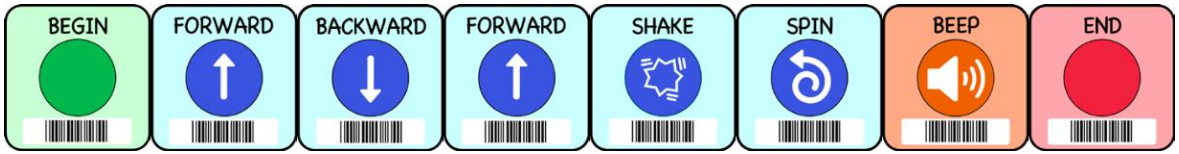




KinderLab robotics

KIBO Does the “Hokey-Pokey”

https://youtu.be/oXBdq3sC9EQ



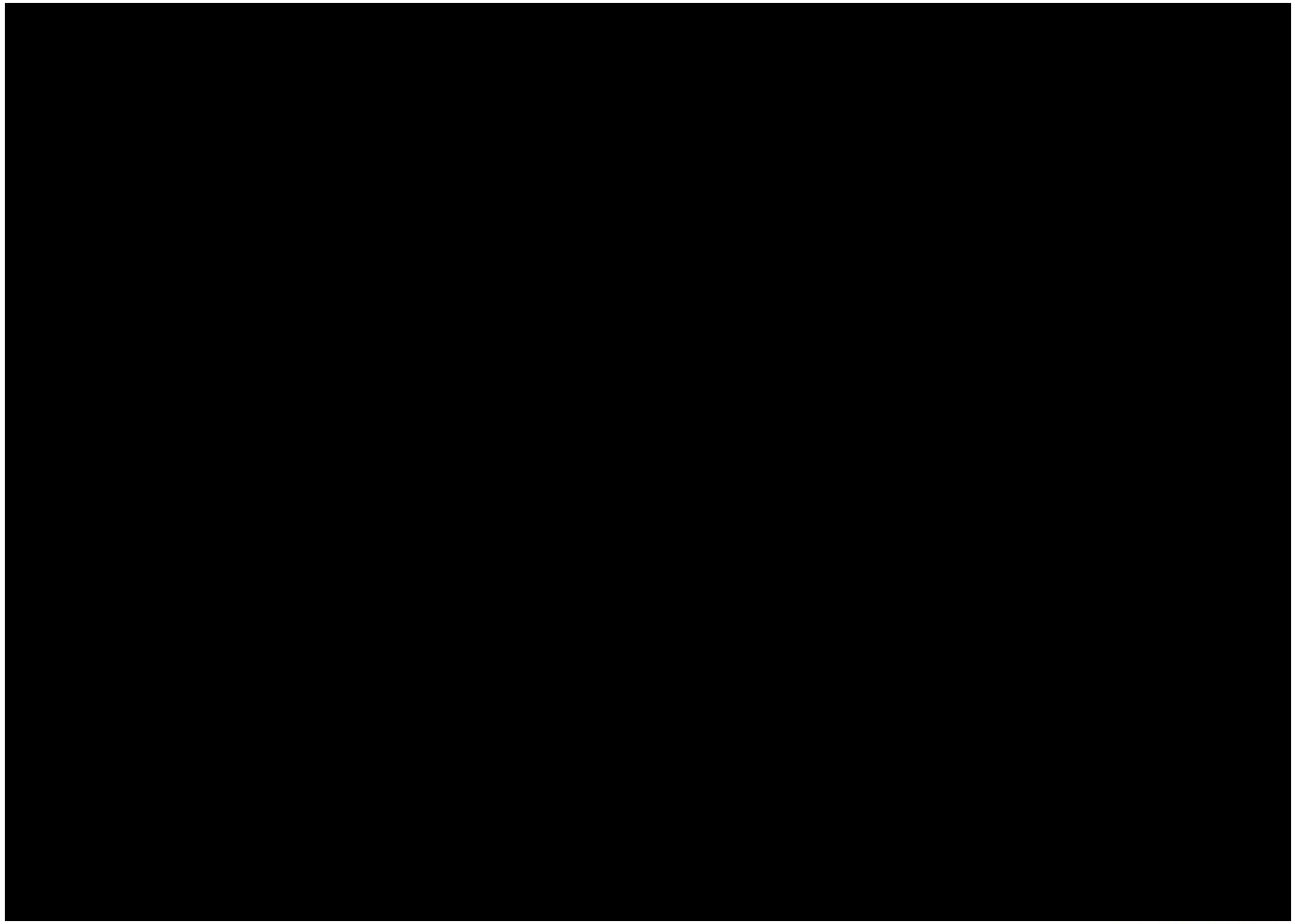
KIBO Within Your Curriculum

Watch KIBO Engineering within a Pre-K classroom

KinderLab robotics

KIBO Within Your Curriculum

Watch KIBO reenact the famous Iditarod Race



KinderLab robotics

KIBO Module-Specific Activity Guides

Activity Guides offer 40 more classroom hours of cross-curricular STEAM activities with KIBO extensions.

- Explore connections to literacy and language, engineering and architecture, mathematics, performing arts, and visual arts.

KinderLab robotics

Curriculum Package Additional Materials

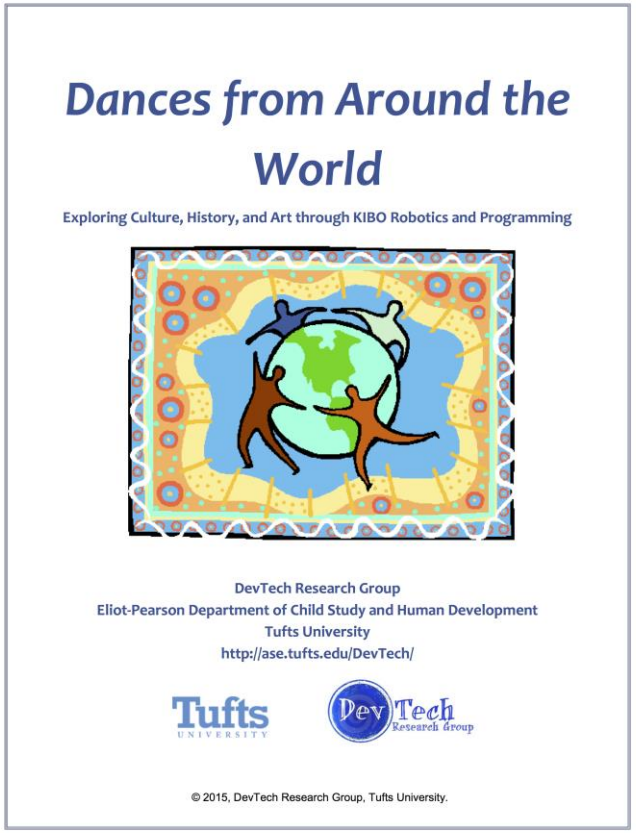
We support teachers with additional materials:

- Introductory Activity Cards
- Engineering Design Journals and Assessment Workbooks (for each student)
- Classroom Posters
- “KIBO Says” Cards for physical games

KinderLab robotics

Integration With Other Subjects

- KIBO Curriculum is built to integrate with other subjects.
- Teachers can integrate the curriculum themselves, or leverage the work of our partners at Tufts University.
- Tufts DevTech's model integrated curricula include:
  - Dances from Around the World (cultural studies)
  - Robotic Animals (science)
  - Treasure Island (literacy)
  - Patterns All Around (math and engineering)



KIBO Classroom Package – Activity Center

This package is designed to serve **4 to 6 students** with the KIBO 18 or KIBO 21 robot.

Includes:

- 2 KIBO 18 or 21 kits
- Pack of 6 Engineering Design Journals
- Pack of 6 Assessment Workbooks
- Activity Guide Cards
- KIBO Curriculum
- “KIBO Says”, class programming game
- Two posters: KIBO and Engineering Process
- Two hours of Professional Development Consultation via phone or skype

KinderLab robotics

KIBO Classroom Package – Small Classroom

This package is designed to serve **10 to 15 students** with the KIBO 18 or KIBO 21 robot.

Includes:

- 5 KIBO 18 or 21 kits
- Pack of 12 Engineering Design Journals
- Pack of 12 Assessment Workbooks
- Activity Guide Cards
- KIBO Curriculum
- “KIBO Says”, class programming game
- Two posters: KIBO and Engineering Process
- Two hours of Professional Development Consultation via phone or skype

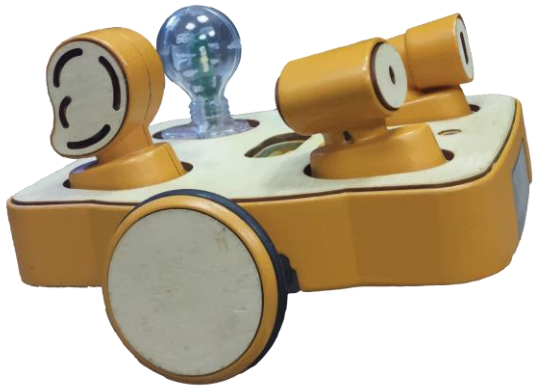
KinderLab robotics

KIBO Classroom Package – Large Classroom

This package is designed to serve **20 to 30 students** with the KIBO 18 or KIBO 21 robot.

Includes:

- 10 KIBO 18 or 21 kits
- Pack of 25 Engineering Design Journals
- Pack of 25 Assessment Workbooks
- Activity Guide Cards
- KIBO Curriculum
- “KIBO Says”, class programming game
- Two posters: KIBO and Engineering Process
- Two hours of Professional Development Consultation via phone or skype



KinderLab robotics

KIBO Research-Based Enhancements

Expression Module

Building Brick Extension Set

Sound Record and Playback Module

KinderLab robotics

KIBO Research-Based Enhancements

Marker Extension Kit

KinderLab robotics

Professional Development

- Train-the-trainer
- On-site
- Remote Webinars
- Training will cover:
  - Product operation
  - Research foundation
  - Curriculum review
  - Integration approaches
  - Support requirements

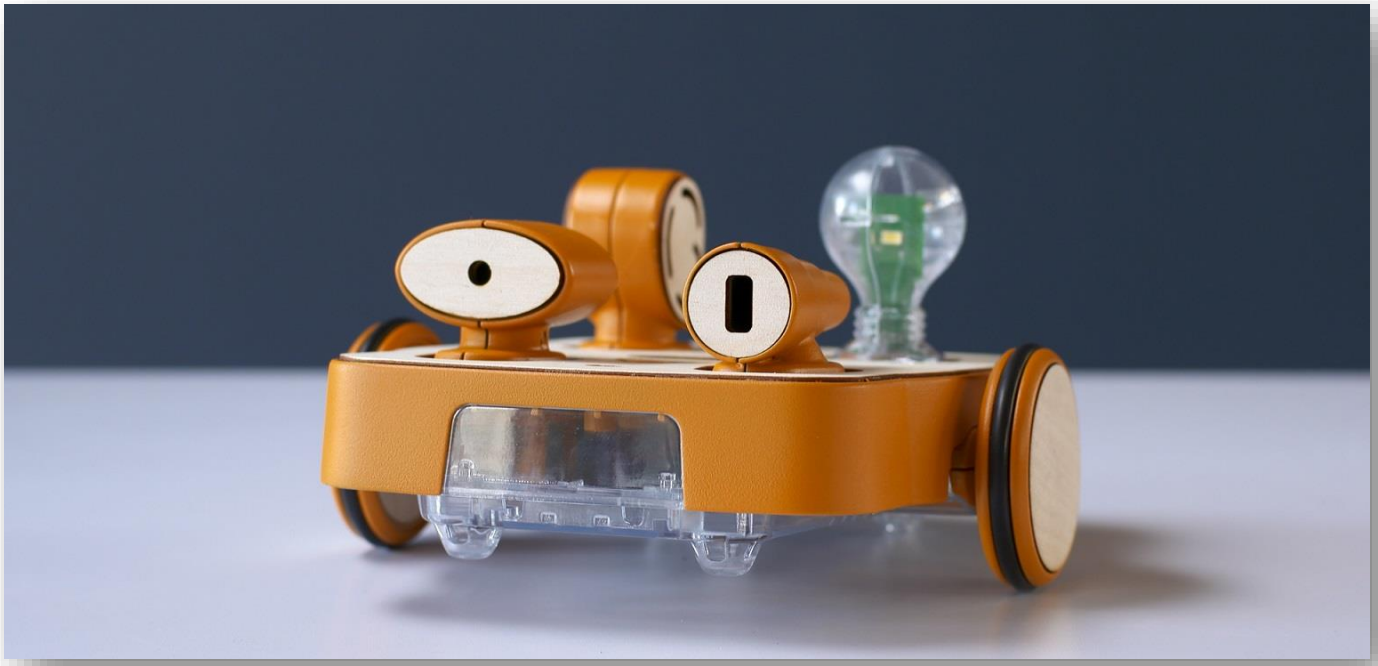
KinderLab robotics

Scale Adoption

1. **Deepen Current Curriculum:** product connections with geometry and literacy
2. **Broaden Curriculum:** Product enhancements that introduce additional STEAM topics, regardless of curriculum
3. **Accessibility:** Research value to students with disabilities
4. **Universality:** Reduce cost to make STEAM literacy available to broader population

KinderLab robotics

How is KIBO Different from All the Others



KinderLab robotics

How is KIBO Different?

- KIBO is the ONLY robot kit that can be built, programmed, and decorated by kids as young as 4 years old.
- Tangible programming language for educational robots
- Offers a unique art platform to add the “A” in STEAM
- Thought leadership: Professor Marina Bers is recognized worldwide authority on STEAM education
- First mover advantage in STEAM for young children
- Requires no screens or keyboards

KinderLab robotics

Questions?

KinderLab robotics

Product Demo – Your Turn!

KinderLab robotics