

# Role of Technology in Early Childhood Interventions

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# Three Tensions

to understand the potential positive impact of new technologies

1. Technologies as:

Playground vs. Playpen

2. Impact as:

Literacy vs. STEM

3. Goal as:

Education vs. Development

# Tension 1: Playground vs. Playpens



*Bers, M. (2012). "Designing Digital Experiences for Positive Youth Development: From Playpen to Playground" Oxford University Press*



Papert → Piaget  
Constructionism  
Tools for thinking  
Focus on Learning  
Programming tools  
Engineering  
Making  
Educational Robotics



Child as producer  
Child-directed  
Unpredictable



→ Skinner  
Instructionism  
Tools for mastering  
Focus on teaching  
Drills, games, etc  
CAI (Computer Assisted Instruction)  
Intelligent Tutoring systems  
Social Robots



Child as consumer  
Adult-directed  
Safe and predictable

# Coding as a playground



Abstract, logical systematic, sequential, algorithmic thinking, problem solving:  
Computational Thinking

*Bers, M. (2018). "Coding as a Playground: Programming and computational Thinking in the Early Childhood Classroom" Routledge*



**DevTech**  
Research Group

The Tufts University Research Group is dedicated to exploring the intersection of technology and education. We focus on developing innovative learning technologies and environments that support the growth of young children in computational thinking and engineering. A developmentally appropriate and playful way.

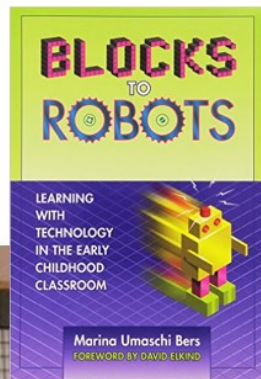
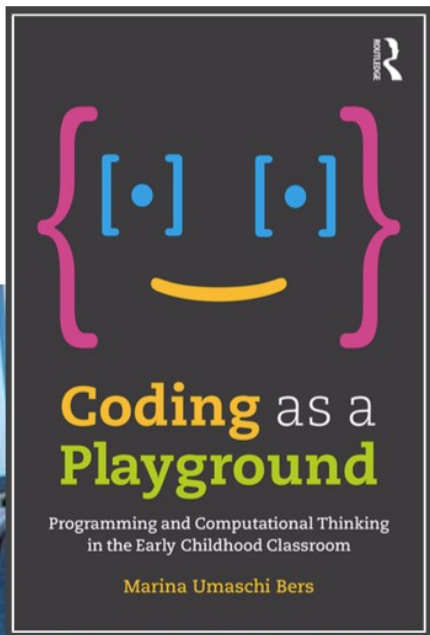
**SCRATCHJR**  
A FREE PROGRAMMING APP WHERE CHILDREN AGES 5-7 CAN CREATE STORIES AND GAMES BY DRAGGING TOGETHER GRAPHICAL BLOCKS.

**KIBO ROBOTICS**  
A FREE, PROGRAMMABLE ROBOT FOR CHILDREN AGES 4-7. NO PREVIOUS EXPERIENCE REQUIRED.

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Home / Explore Graduate Programs / Early Childhood Technology

## Early Childhood Technology

The Tufts Early Childhood Technology (ECT) certificate program is designed for educators and practitioners working with young children in



## The Early Childhood Robotics Network

Brought to you by Tufts University's DevTech







ScratchJr



KIBO robot

Projects funded by the National Science Foundation  
NSF DRL-1118897 & NSF DRL-1118664.



SCRATCHjr

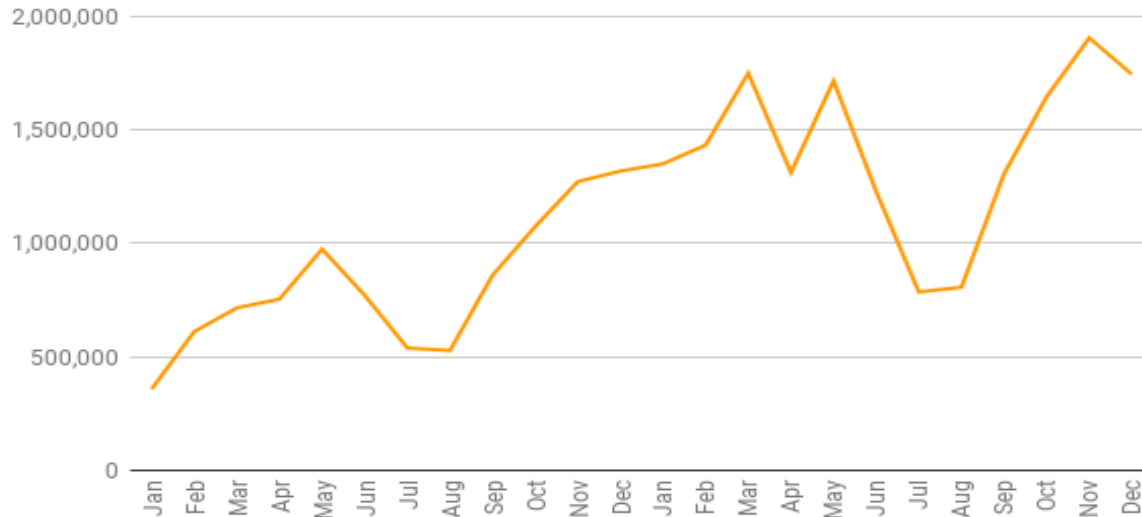


Dev  
Tech  
Research Group

# ScratchJr User Analytics:

## Jan. 2016 – Jan. 2017

Monthly sessions



### Top 5 countries

1. United States
2. United Kingdom
3. Australia
4. Canada
5. Sweden

Western Sahara & North Korea are the only countries NOT using ScratchJr.

- Over 9.5 million downloads since 2014 launch
- 19 million projects created
- PBS KIDS ScratchJr has over 1 million downloads
- 2,246 different registered languages & dialects



<http://www.scratchjr.org/>







# KIBO



# KIBO (Continued)



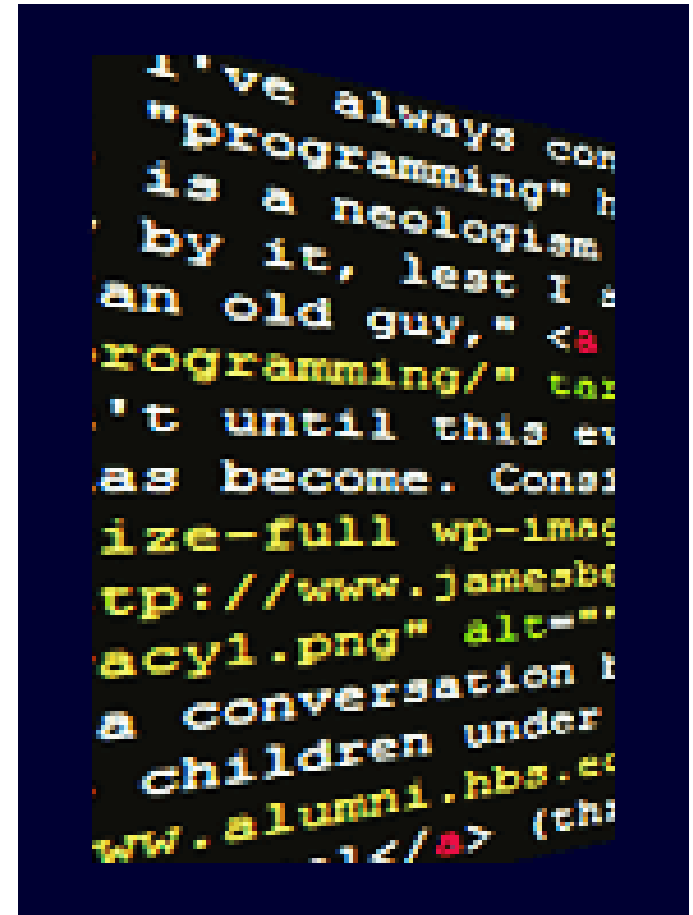
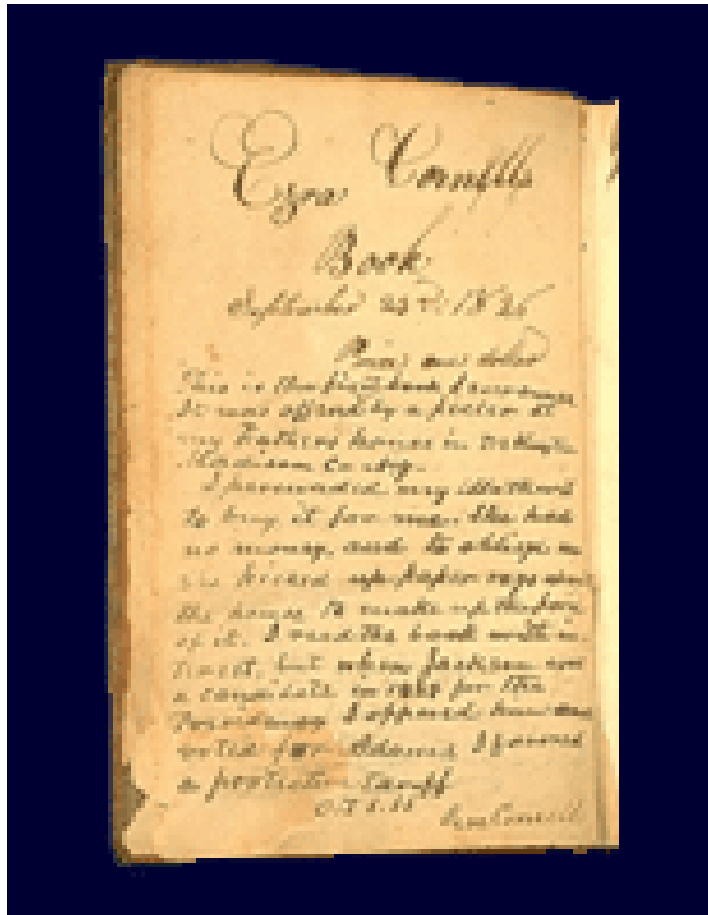








## Tension 2: Literacy vs. Science, Technology, Engineering, and Mathematics (STEM)







# Family Coding Days



ScratchJr  
Family Days

KIBO  
Family Days



What is the impact of graphical vs. tangible interfaces on children's learning outcomes and family roles?





# From applied to basic science



# What happens in the brain when kids program?

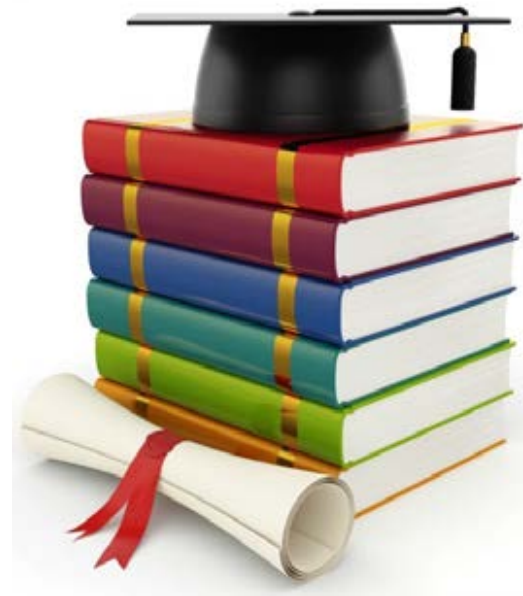
If coding is a literacy, would the  
language brain regions activate while  
programming?

# The cognitive and neural mechanisms of computer programming in young children: storytelling or solving puzzles?



PI Marina Bers (Tufts) ; co-Pi Ev Fedorenko (MIT/MGH)  
IIS-1744802

# Tension 3: Development vs. Education







Importance of play

Focus on whole child

All dimensions of development

Complex and multidimensional

Developmental trajectories

Difficult assessments



Novel interfaces (tangible, etc.)

Formal and informal settings



Importance of practice and  
repetition

Focus on school readiness

Emphasis on cognitive domain

Linear and unidimensional

“Personalized” learning

Scalable assessments



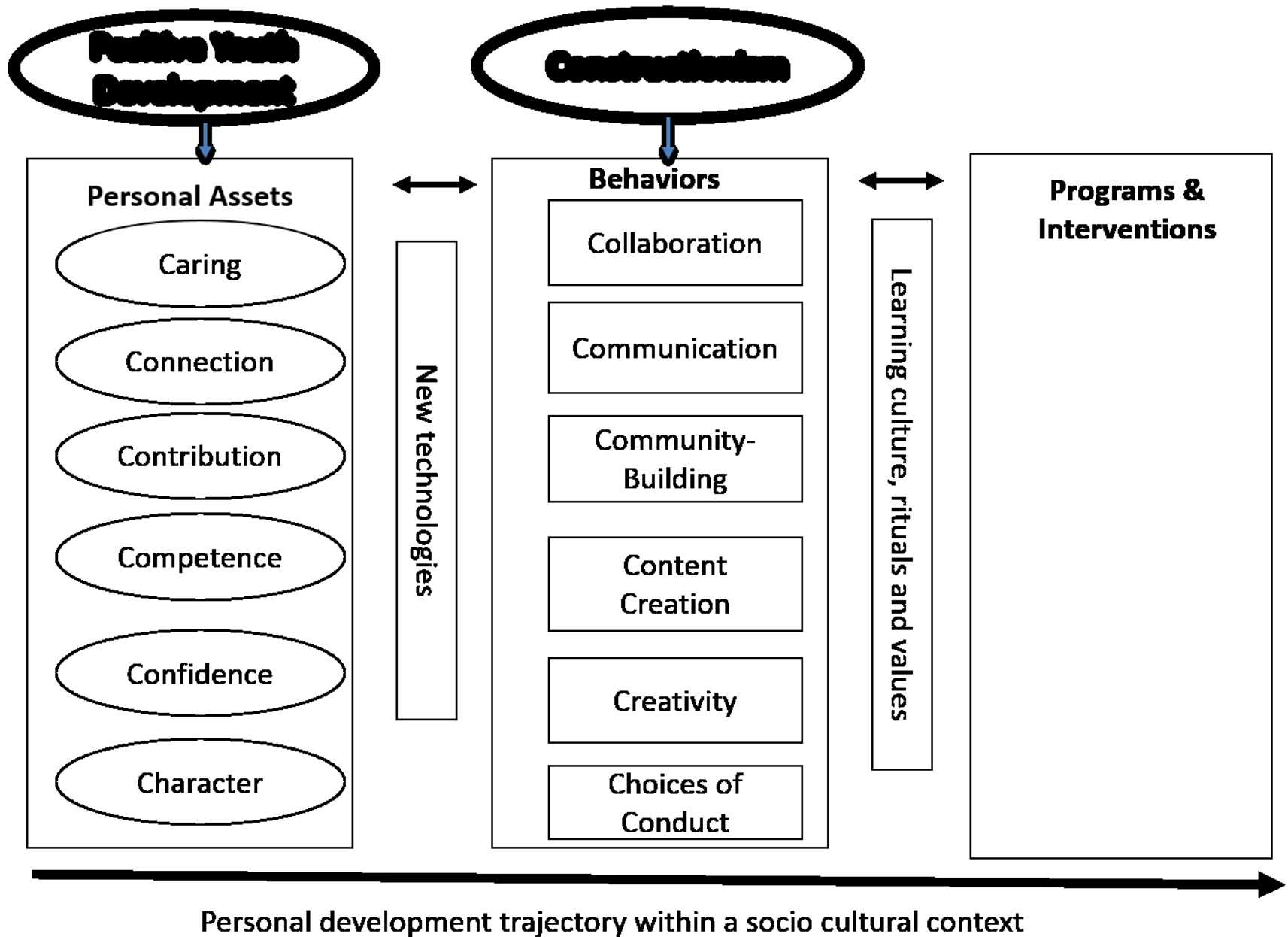
AI and software

School settings

# Developmental Technologies

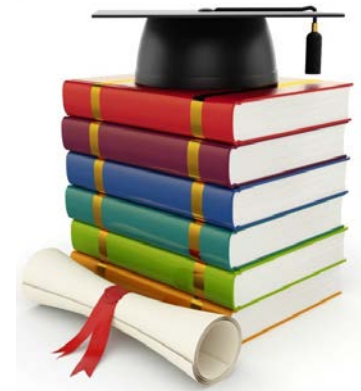
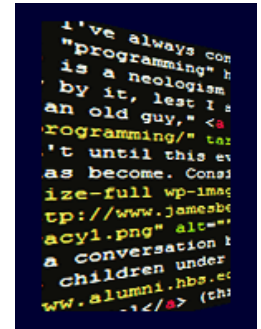


# Positive Technological Development (PTD) framework



# Implications

- Engaging in basic research
- Rethinking research methodologies
- Developing evaluation instruments
- Creating new interfaces and technological systems
- Investment of resources
- Professional development
- Curricular frameworks and alignments
- Consumer education
- Parent education
- Teacher education





# Thanks!



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Science

You can't start young enough



[www.aaas.org](http://www.aaas.org)

This work is supported by:  
NSF awards # DRL-0735657; NSF DRL-111889; NSF

I am grateful to students and staff in my DevTech research group at Tufts University!