Early Learning 2.0 with families

Tech Time with Purpose: A Creative Approach to Using Digital Devices with Young Children

December 15, 2020

Presenter: Michelle Weissman Randall, PhD
Head of Research and Evaluation, Bay Area Discovery Museum

Host: Shana Sojoyner
Library Programs Consultant, California State Library

This project is supported by the U.S. Institute of Museum and Library Services under the provisions of the Library Services and Technology Act, administered in California by the State Librarian.

Bay Area Discovery Museum

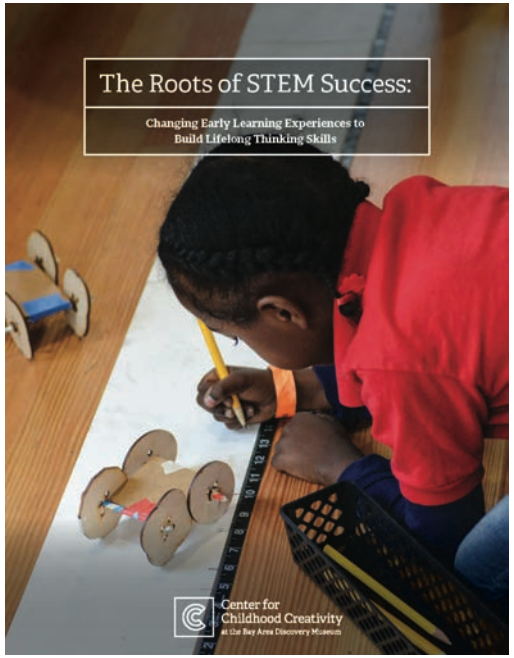
California State Library
Founded 1850
Preserving Our Heritage. Shaping Our Future

Our mission is to transform research into early learning experiences that inspire creative problem solving

Bay Area Discovery Museum

@BADM_org

Research to Practice



https://bayareadiscoverymuseum.org/research-resources/publications

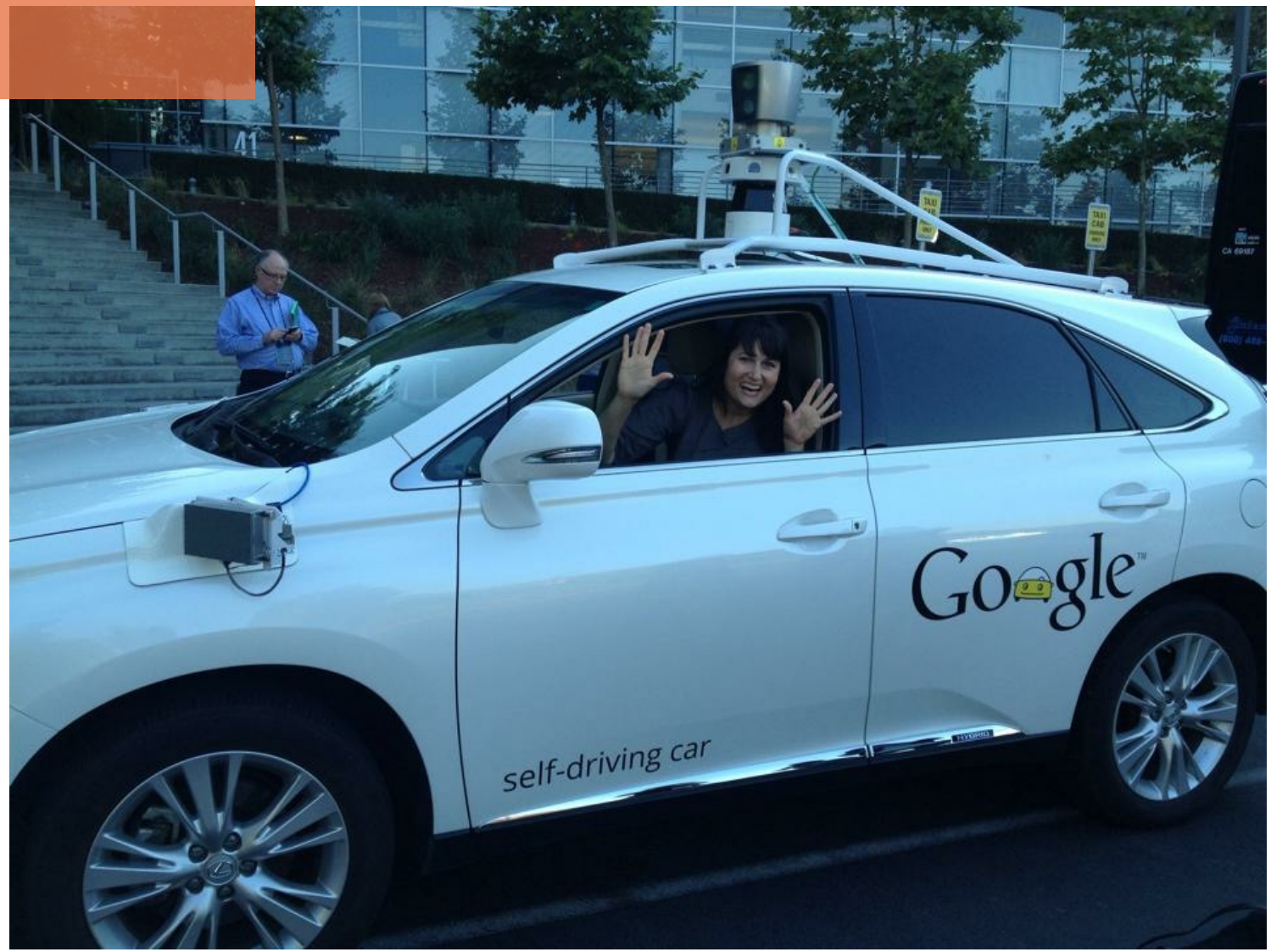
Poll

In general, how comfortable are you with trying new technology?

a. Extremely Comfortable
b. Somewhat Comfortable
c. Somewhat Uncomfortable
d. Extremely Uncomfortable

The Technology Boom

Not only are new technologies being created at a rapid rate, but the rate at which consumers *adopt* them is also increasing.

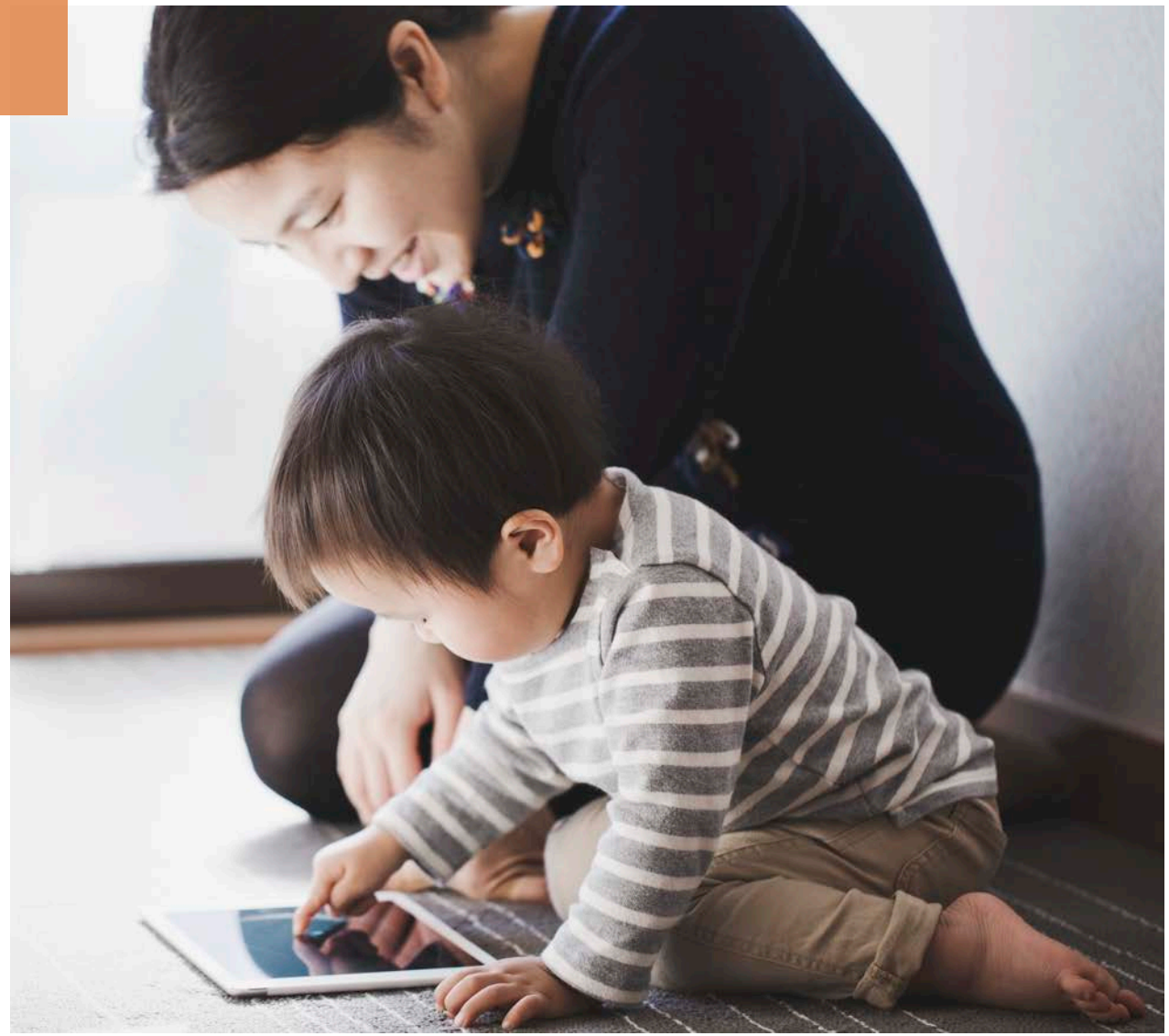


Tech Use Statistics (Rideout, 2017)

On an average day, children…

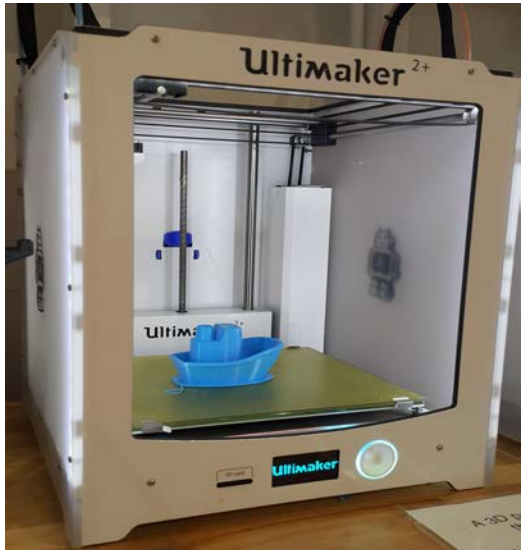
- 0 to 8 years-old: spend approximately 2 hours and 19 minutes engaged with screens
- 2 to 4 years-old: play video games for 21 minutes
- 5 to 8 years-old: play video games for 42 minutes

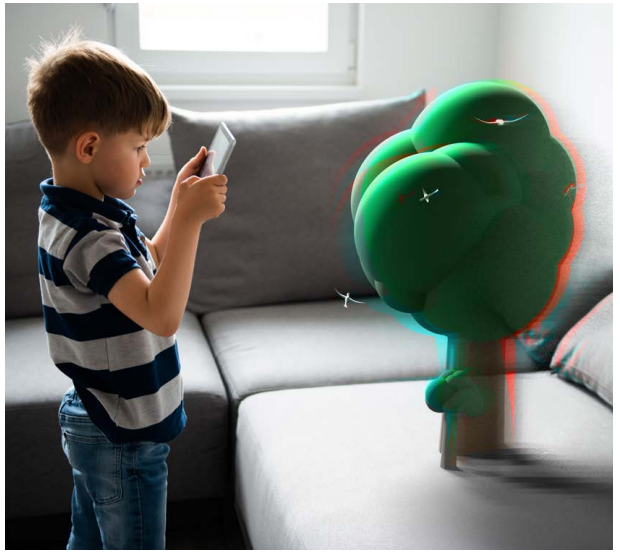
- 9% of homes with children ages 0 to 8 have conversational agents



Literature Review

1. Digital Games
2. Coding
3. Augmented Reality (AR) & Virtual Reality (VR)
4. Digital Fabrication
5. Social Robots & Conversational Agents






C
Child-Directed
Children are in charge of their own learning and have choice over the materials, topics, or activities they want to enjoy, based on what is personally meaningful or relevant to their lives.
R
Risk-Friendly
Children are emotionally supported to try new things, including tasks and activities that challenge them and encourage them to develop new skills.
E
Exploratory
Children are guided by their natural curiosity to ask questions, come up with ideas, and engage in hands-on learning through play.
A
Active
Children have opportunities to frequently move their bodies and can practice big body movements (e.g., running, jumping), along with fine motor skills (e.g., grasping a pencil).
T
Time for Imagination
Children are encouraged to engage in pretend play and to dream up imaginary worlds, even beyond the preschool years.
E
Exchange of Ideas
Children engage in conversation and collaboration with adults or peers, which reinforces that their ideas matter, and supports them to build off of the ideas of others.

Poll

Do you use any of the following digital technologies in your programming with children/youth? (check all that apply)

a. Digital Games

b. Coding

c. Augmented Reality (AR) & Virtual Reality (VR)

d. Digital Fabrication

e. Social Robots & Conversational Agents

Digital Games

Any game that is played using a digital device, such as a tablet, mobile phone, computer, or television.

Digital Games

Many digital games use extrinsic motivators and, in some situations, it leads to better performance.

However, the goal should be that children become interested enough to continue their learning without the promise of a prize.

Motivation

Intrinsic

Driven by a child's own interests or desires, including:

- Autonomy
- Curiosity
- Learning

Extrinsic

Driven by outside influences, including:

- Prizes
- Points
- Rewards

Digital Games

Digital games provide rich opportunities for collaboration

Digital Games: Summary

- Children can learn from digital games
- Not all games are created equal
- Understand the role of intrinsic vs. extrinsic rewards
- Digital games can be used to facilitate collaboration
- Take the time to find apps and games that offer more open-ended opportunities – where children can make decisions and discover multiple solutions

Coding

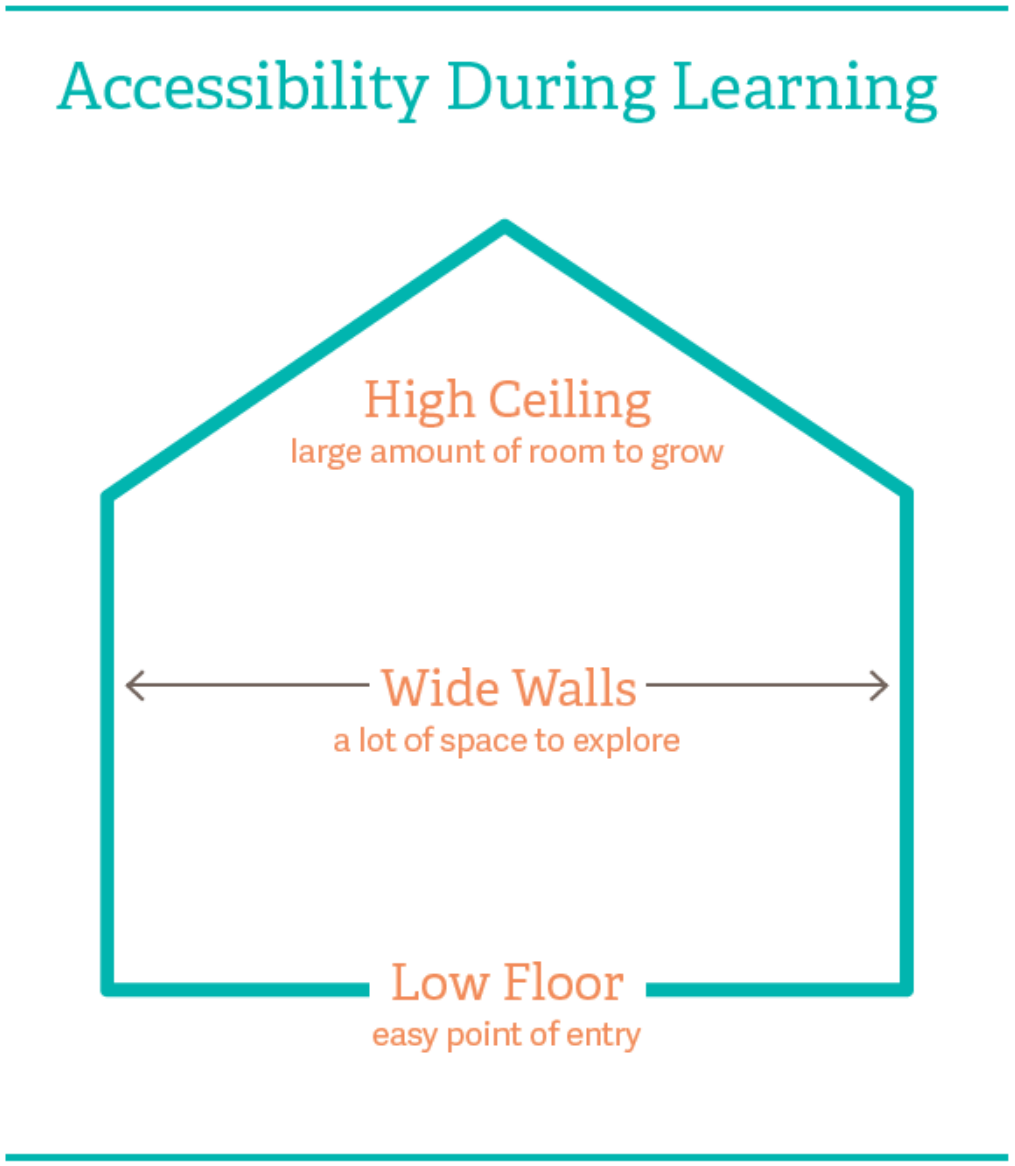
Creating a sequence of instructions and translating it into a language a computer can understand in order to complete a particular task.

Coding

- Coding allows children to be in control; to become digital creators
- Coding shares similarities with traditional language
- Evidence strongly suggests that programming is positively associated with a greater understanding of sequencing

Coding

Finding the appropriate level of challenge



Promoting early programming motivation via coding experience

Master, Cheryone, Moscatelli, and Meltzoff (2017)

Pre-test and Post-test

Six year old children completed measures of technology motivation (interest and self-efficacy with regard to programming and robots) before and after the intervention.

Robot (experimental condition)

Children used a drag-and-drop programming system to code a robot's movements to navigate several different paths. Children could program the robot to move forward, make left and right turns, and create loops to repeat moves.

Control conditions

1. Storytelling condition: Children played a storytelling card game.

2. No activity condition: Children did not play any games.

Results: For children in the robotics intervention group, there was no gender difference in motivation. In contrast, boys reported greater technology motivation (interest and self-efficacy) than did girls in the two control conditions.

Conclusion: The brief robotics programming experience boosted girls' technology motivation such that there was no longer any gender difference in programming and robotics motivation.

Coding: Summary

- Young children can practice basic coding skills using coding games and toys
- Non-digital activities can be building blocks for future tech use

Augmented and Virtual Reality (AR & VR)

AR: the user's view of the real world is modified by superimposing digital components.

VR: fully immersive experience where an individual interacts with a 3D virtual world.

VR

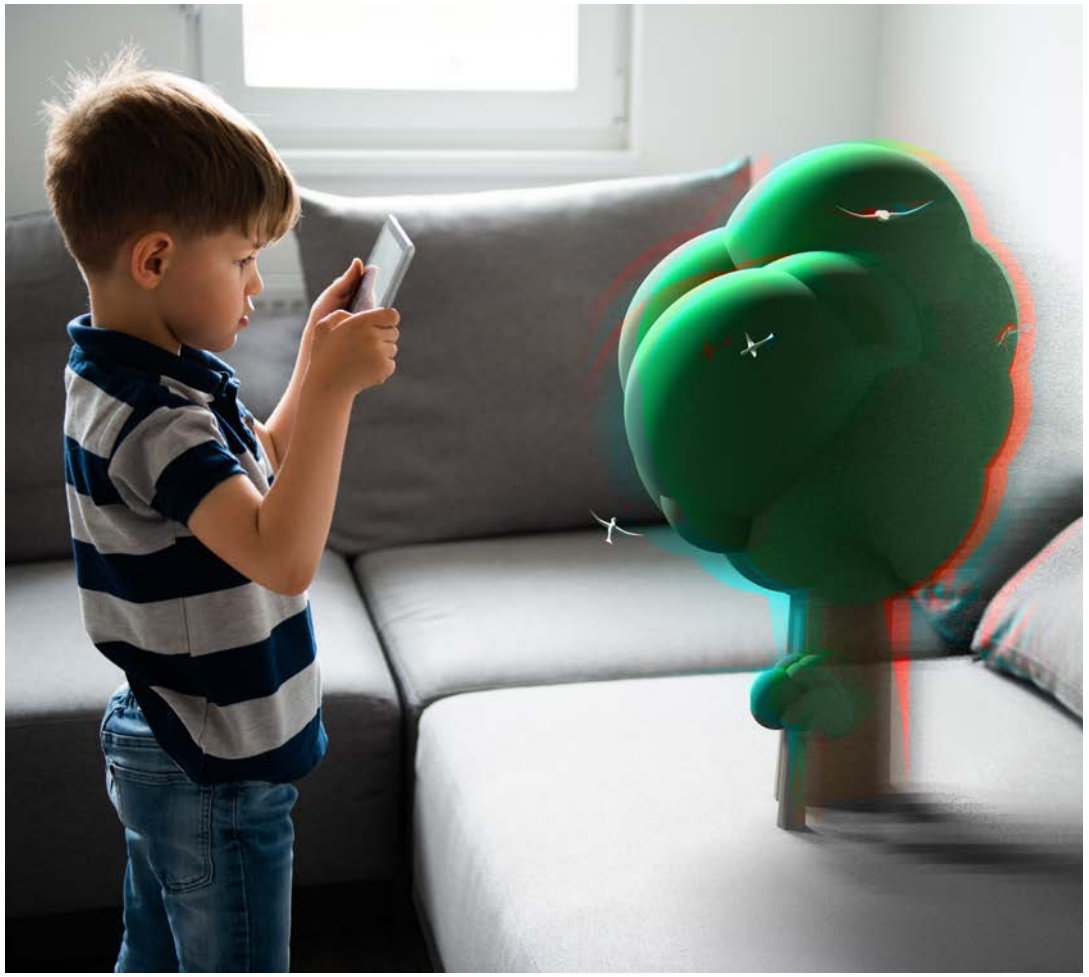
"Virtual reality (VR) is likely to have powerful effects on children because it can provoke a response to virtual experiences similar to a response to actual experience."

– Aubrey, Robb, Bailey, and Bailenson (2018, p. 2)

AR

Using AR may increase motivation for tasks

AR can be used to teach traditional academic subjects



AR & VR: Summary

- Have conversations about the difference between fantasy and reality
- AR & VR experiences can be used to promote physical activity
- Both fine and gross motor activities play a role in how children explore and learn about their environment

Digital Fabrication

The method of using a computer to create a design which is then transformed into a real object.

Poll

Does your library have a makerspace or Fab Lab?

a. Yes
b. No
c. N/A

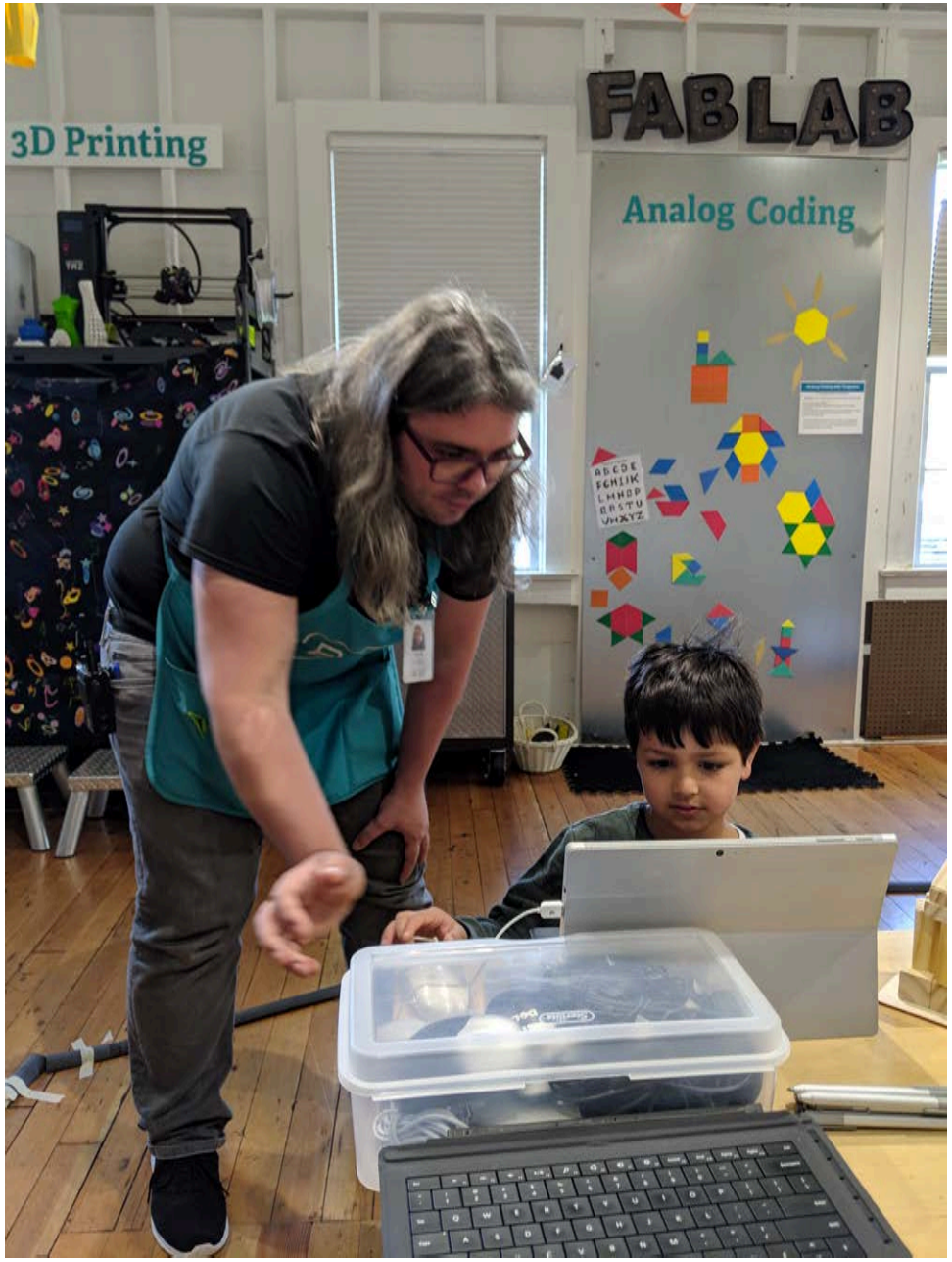
Digital Fabrication

- Young children show interest and motivation in digital fabrication tools
- Young children can learn how to use digital fabrication tools.

BADM's Fab Lab Study

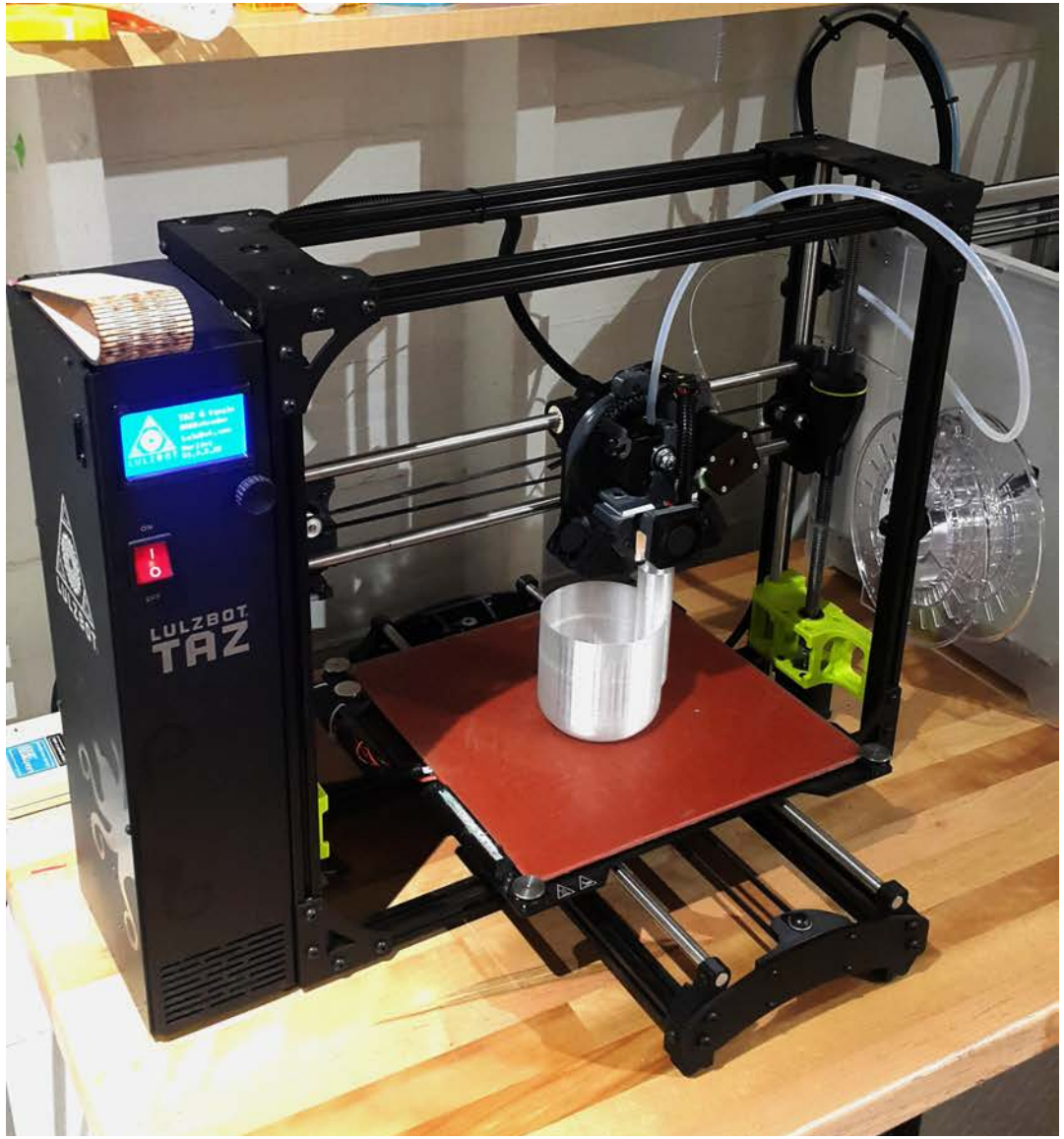
- Camp with 7 – 10-year-olds
- Classes with 4 – 5-year-olds

"You can see...something going from nothing to what you imagined it...it's like your creations are coming to life."



Digital Fabrication: Summary

- Great for facilitating imagination in young children.
- Children need to understand complex concepts about scale and proportion as they navigate between 2D to 3D



Digital Fabrication: Summary

- Key features of successful makerspaces (Iivari et al, 2016):
  - Familiar environments
  - Centered on personal interests
  - Foster collaboration
  - Child as a central role in learning
  - Result in tangible products

Social Robots & Conversational Agents

Social Robots: robots intentionally designed to respond to social behaviors and interactions with humans and other robots

Conversational Agents: digital systems that allow people to use vocal commands to play games, listen to music, gain information, etc.

Social Robots & Conversational Agents

Young children can learn just as much with social robots as they can from a human teacher.

Social Robots & Conversational Agents: Summary

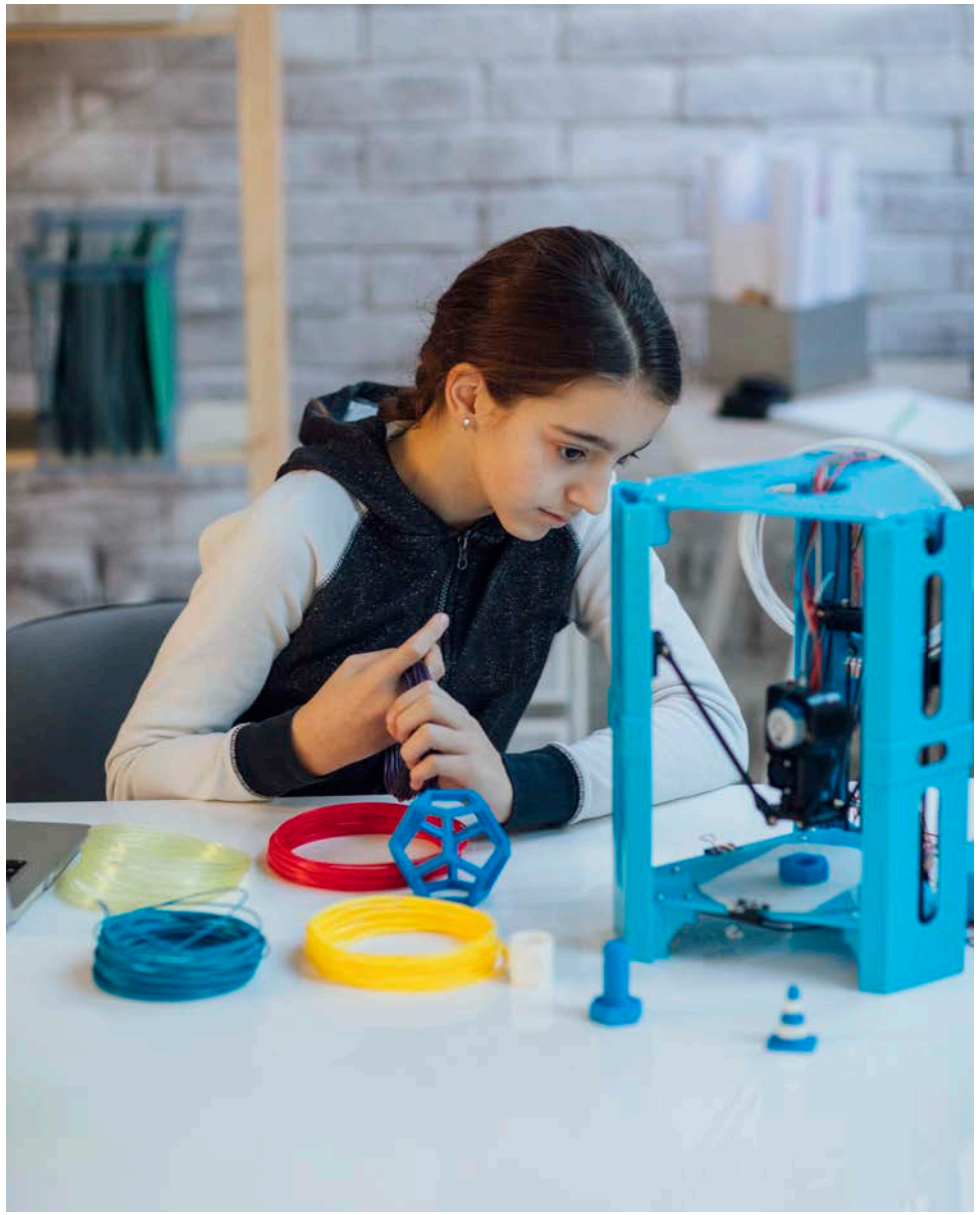
- Young children may become frustrated if the robot or conversational agent does not understand them.
- Sometimes young children view social robots more “real” as other inanimate objects

Recommendations

- Tech should be used to enhance the teaching and learning process, not replace it.
- Be aware of your own mindset toward technology
- Know your technology
- Use BADM's CREATE Framework to guide tech use

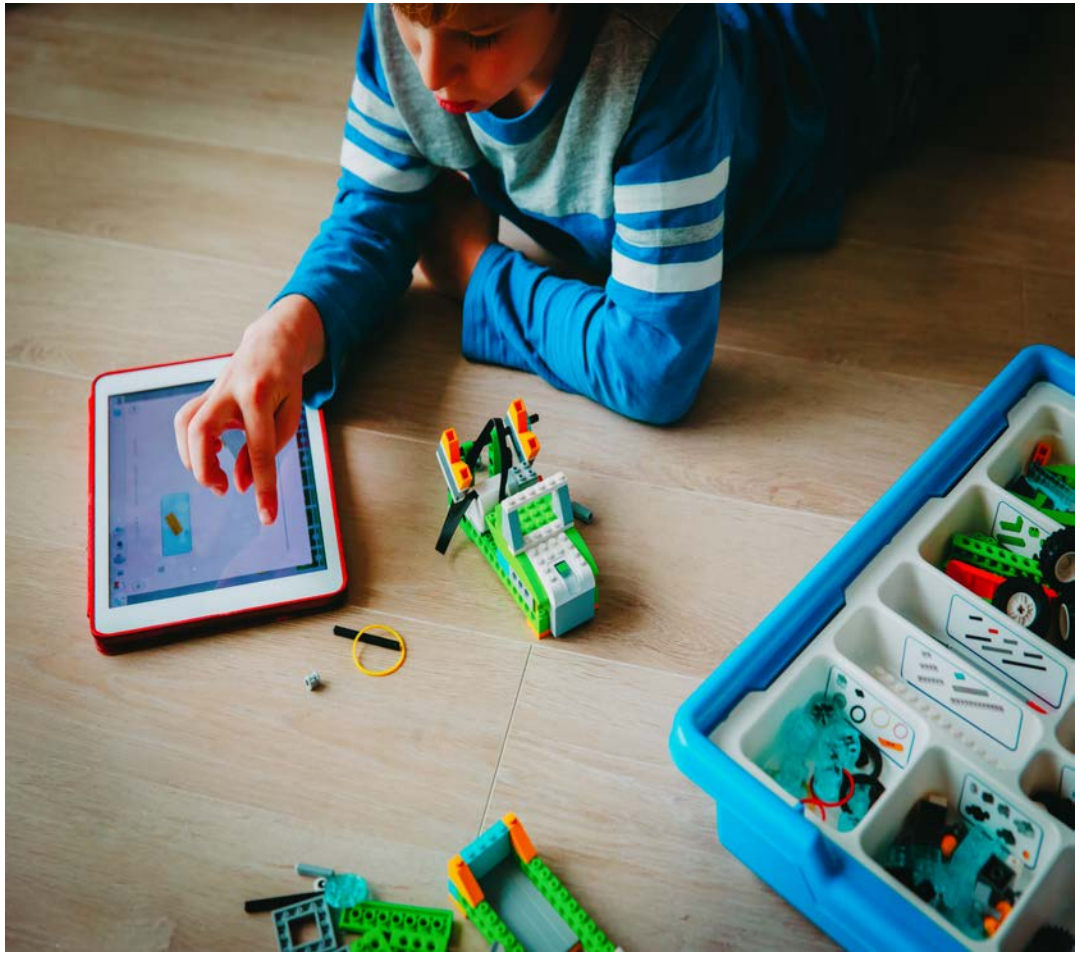
Recommendations: Child-Directed

- Use tech tools and materials that let children express their ideas
- View technology as a tool for creation
- Use digital technology *with* children
- If a child is reluctant to try something, bringing in a digital component could help kick-start their interest



Recommendations: Risk Taking

- Digital technology is one way children can take risks without high stakes
- Let children try to solve problems on their own
- Offer increasingly involved levels of assistance
- Avoid being involved when children do not need your help



Recommendations: Exploratory

- Make use of Fab Labs and Makerspaces
- Look for technology with open-ended experiences
- Even preschoolers can practice basic coding and computational thinking using games and toys.
- Use non-digital, open-ended play to prepare young children for later use of technology

Recommendations: Active

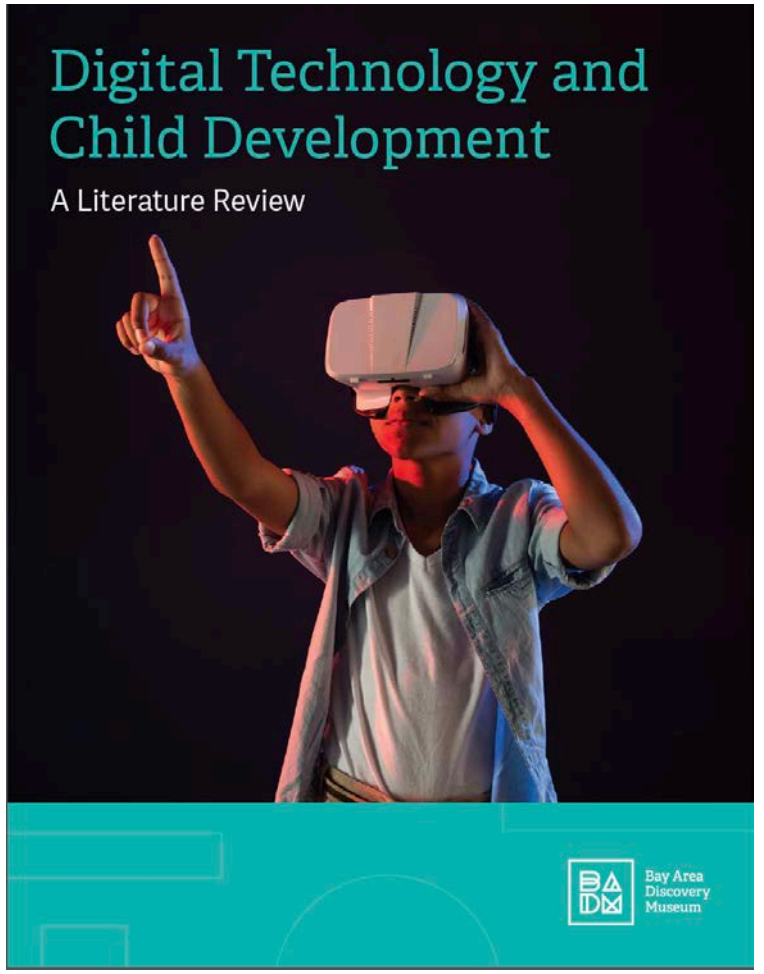
- Technology does not replace children's basic need for outdoor physical play
- Incorporate tech that has children up and moving around

Recommendations: Time for Imagination

- Use technology to encourage imagination and pretend play, even into the elementary years
- Help children think about how to bring their fantastical ideas to life with technology

Recommendations: Exchange of ideas

- Model and encourage back and forth conversations and collaborations
- Digital conversations should not take the place of human ones.
- Look for tech experiences that are social or collaborative.
- Don’t think of tech as a one-on-one interaction between children and the device



https://bayareadiscoverymuseum.org/research-resources/resources/activities

Some of the Tech Mentioned Today…

AIBO

Alexa

Angry Birds

Code-a-pillar

Flummoxvision

Fortnite

KIBO Robots

Minecraft

Neopets

Ozobot

Peppy Pals Sammy Helps Out

Pokemon Go

Scratch Jr

Siri

Storybird

Tiltbrush

The Sims

Toca apps

Twitch

YouTube

For more information on evaluating technology…

- American Academy of Pediatrics
- Common Sense Media
- Erikson Institute: Technology in Early Childhood Center
- Fred Rogers Center
- National Association for the Education of Young Children
- Technology & Interactive Media for Young Children

Thank you!

For more information about
Tech Time with Purpose, contact:
Michelle Weissman Randall, PhD
mrandall@badm.org

For more information about
Early Learning with Families (ELF), contact:
Shana Sojoyner
shana.sojoyner@library.ca.gov

Bay Area
Discovery
Museum

@BADM_org