Developing a new generation of collaborative scientists and citizens through popular media

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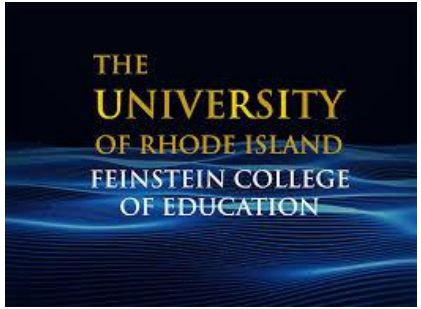
Lisa Jones & Christine Ricci



While waiting think about a scientist at work.
Who are they, where are they, and what are they doing?

Previous STEM Research Defines the **Problem**

Science Is Not Solitary

Perception
- Science is done alone
- Lone genius in a lab

Research Reality
- Science is collaborative
- Interdisciplinary teams dominate
- Teams produce higher-impact work

Takeaway:
Science is social.

Who "Looks Like" a Scientist?

Perception
- White
- Male
- Chemist in a lab coat

Research Reality
- Stereotypes persist in children's images
- Science is increasingly diverse
- Diverse teams → more innovation & impact

Takeaway:
Diversity strengthens science.

The STEM Gender Gap

Perception
- Girls are less interested in STEM

Research Reality
- Girls show early interest & competence
- Stereotypes signal "STEM = masculine"
- Climate & bias reduce persistence

Takeaway:
The gap is cultural and interventions are needed for ALL

Archer, L., DeWitt, J., Osborne, J., Dillon, J., Willis, B., & Wong, B. (2010); Bian, L., Leslie, S.-J., & Cimpian, A. (2017); Chambers, D. W. (1983); Cheryan, S., Ziegler, S. A., Montoya, A. K., & Jiang, L. (2017); Freeman, R. B., & Huang, W. (2014); Leahey, E., Beckman, C. M., & Stanko, T. L. (2017); Miller, D. I., Nolla, K. M., Eagly, A. H., & Uttal, D. H. (2018); National Academies of Sciences, Engineering, and Medicine. (2018).; Page, S. E. (2007). Wuchty, S., Jones, B. F., & Uzzi, B. (2007).

Previous Psychology Research Defines the **Intervention**

Media Shapes Science Identity

Research Reality

- Media exposure shapes children's beliefs about who belongs in STEM
- Counter-stereotypical portrayals shift attitudes and aspirations
- Representation influences identity formation

Takeaway:

Media is a powerful lever for reshaping science perceptions.

Early Intervention Matters

Research Reality

- Gender-science stereotypes emerge by age 6
- Early identity beliefs predict long-term STEM pathways
- Intervening in early childhood increases likelihood of lasting change

Takeaway:

The earlier we intervene, the greater the long-term impact.

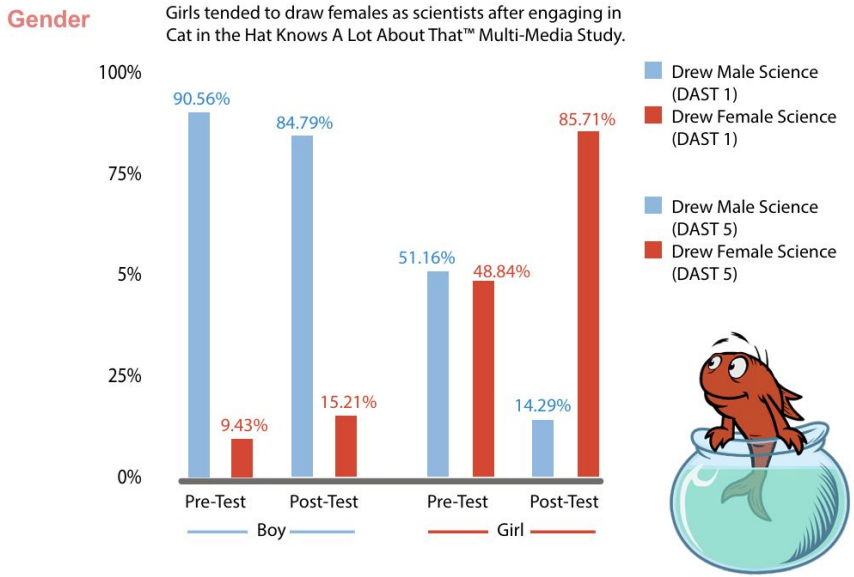
Bian, L., Leslie, S.-J., & Cimpian, A. (2017); Bond, B. J. (2016); Cheryan, S., Master, A., & Meltzoff, A. N. (2015); Coyne, S. M., et al. (2016); Eccles, J. S. (2009); Miller, D. I., Nolla, K. M., Eagly, A. H., & Uttal, D. H. (2018)

new episodes

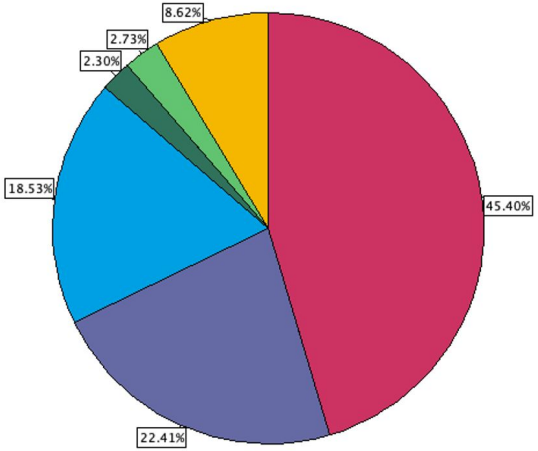
Addressing **GAPS**

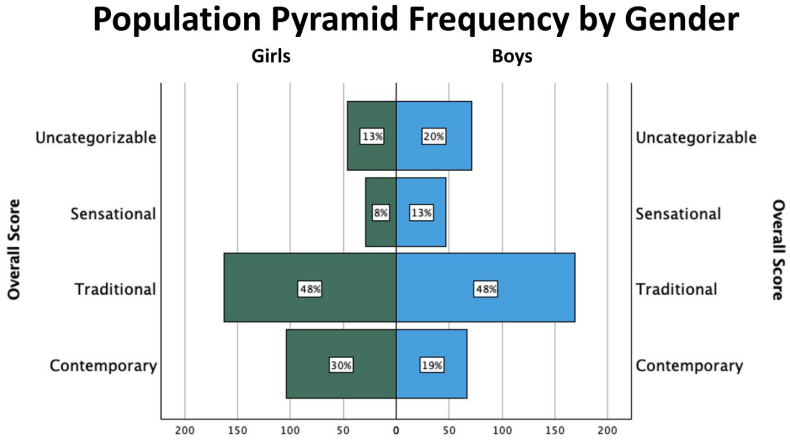
We know very little about how young children conceptualize women in science especially across gender.

We lack developmentally appropriate, scalable assessment tools that capture young children's perceptions of science, identity, and collaboration in ways that are efficient to administer and analyze.



Uncategorizable	Sensational	Traditional	Contemporary
Does not have any science-related fetaures	Must have a least one of the following features	Must have at least one of the following features	Must not be categorized as sensational/ traditional and have one of the following
Unknown location	Unrealistic STEM work	Works in chemistry lab	Realistic STEM field work other than chemisty
Stick figure	Magical	Labcoat	Collaborate with others
Science features cannot be assumed	Superhero/ evil	Glasses/ goggles	Demonstrated diversity/ inclusion





.	EPISODE TITLE	NSF 1. Reduce "Gender Salience"		NSF 2. Introduce Female Scientists + Engineer Role Models			NSF 3. Demons Mixed-Gend Collaboratio
		a) Intentionally highlight both "masculine" and "feminine" attributes within each character.	b) The solution will rely on mixed-gendered-type activities. Gender neutral job titles will be given to all characters.	a) Showcase women characters who contribute to the community through STEM careers.	b) Create new role models that increase women's visibility and power within the field.	c) Highlight traditional feminine attributes and their role in STEM investigations to show they are among the requirements for success.	a) The characters in the will discover that mixed collaboration allows for perspectives which help solve problems.
227A	Once a Pond a Time	☐	☑	☑	☑	☑	☑
227B	Big Night	☑	☑	☑	☑	☑	☑
228A	The Ocean Explorers	☐	☑	☑	☑	☑	☑
228B	A Gourd Idea	☑	☑	☐	☐	☐	☑
229A	Monarch Recharge	☐	☑	☑	☑	☑	☑
229B	A Duck at the Dock	☑	☑	☑	☑	☑	☑
230A	Sunflower Mystery	☑	☐	☐	☐	☐	☑
230B	The River Walk	☑	☐	☑	☑	☑	☑

NSF 2. Introduce Female Scientists + Engineer Role Models

Design for Change Framework			
Care	Imagine	Do	Share

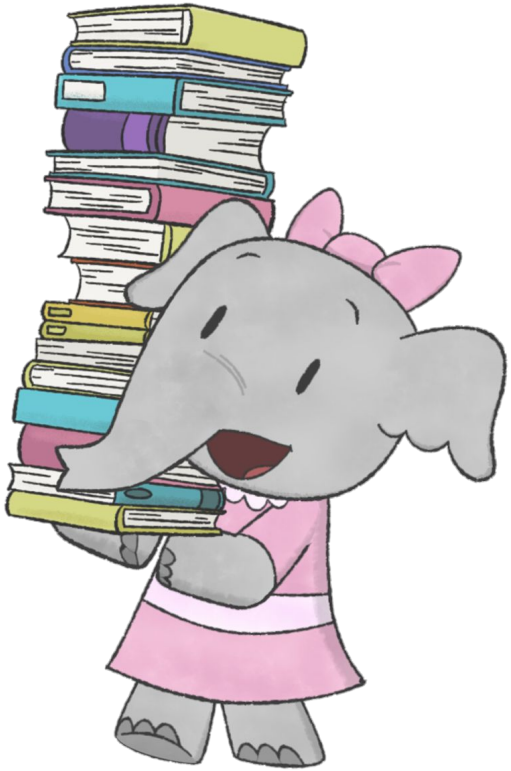
a) Showcase women characters who contribute to t[illegible] co[illegible]munity [illegible] STEM	b) Create new role models that increase women's visibility and power within the field.	c) Highlight traditional feminine attributes and their role in STEM investigations to show they are among the requirements for success.

NSF 1. Reduce "Gender Salience"

a) Intentionally highlight both “masculine” and “feminine” attributes within each character.	b) The solution will rely on mixed-gendered-type activities. Gender neutral job titles will be given to all characters.

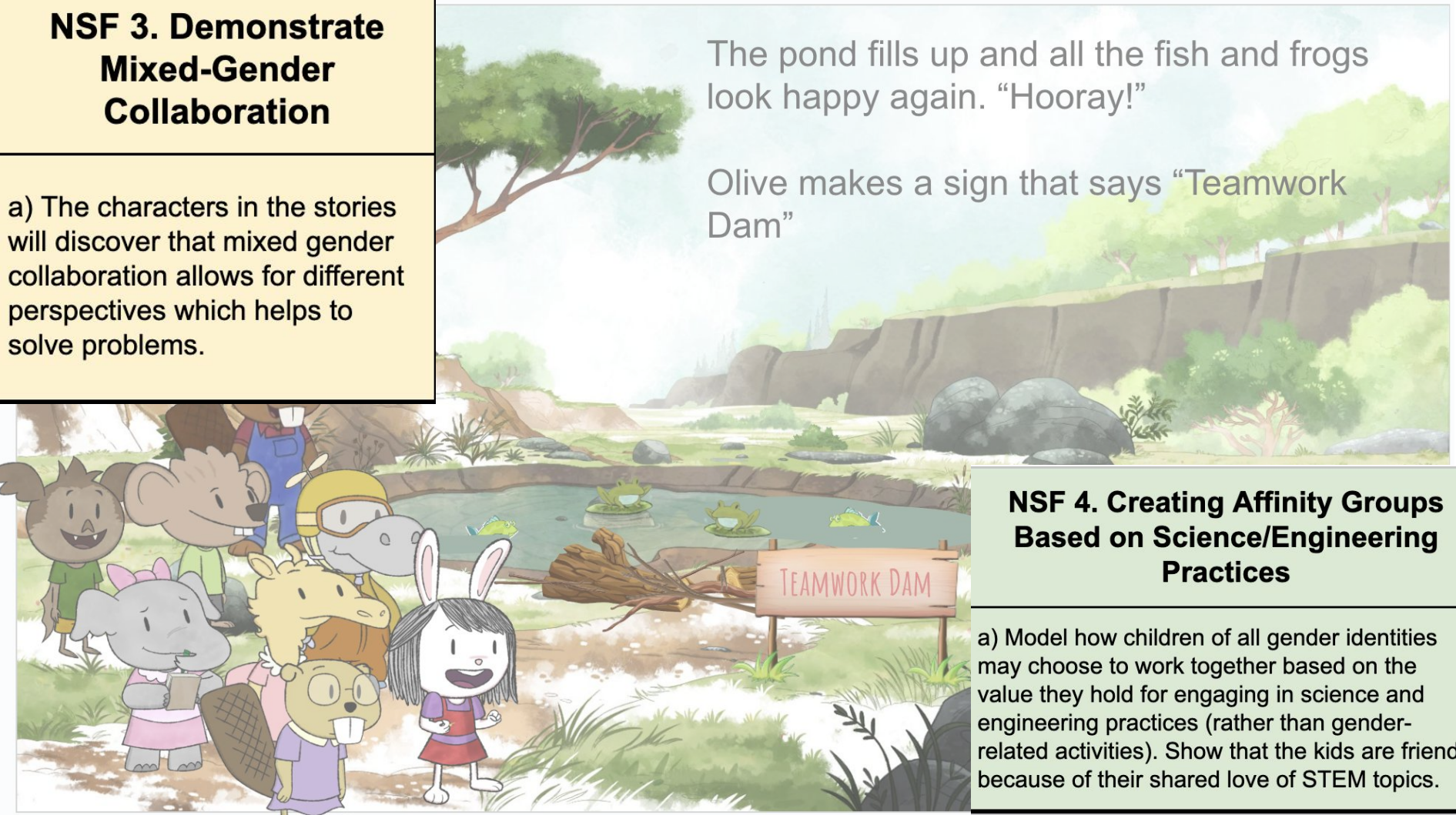
Gender Schema Theory (GST), established by Martin and Halverson (1981), posits that children actively construct mental frameworks to organize information about gender, shaping their behavior, preferences, and memory based on cultural norms.

Rethinking Previous Season



NSF 3. Demonstrate Mixed-Gender Collaboration

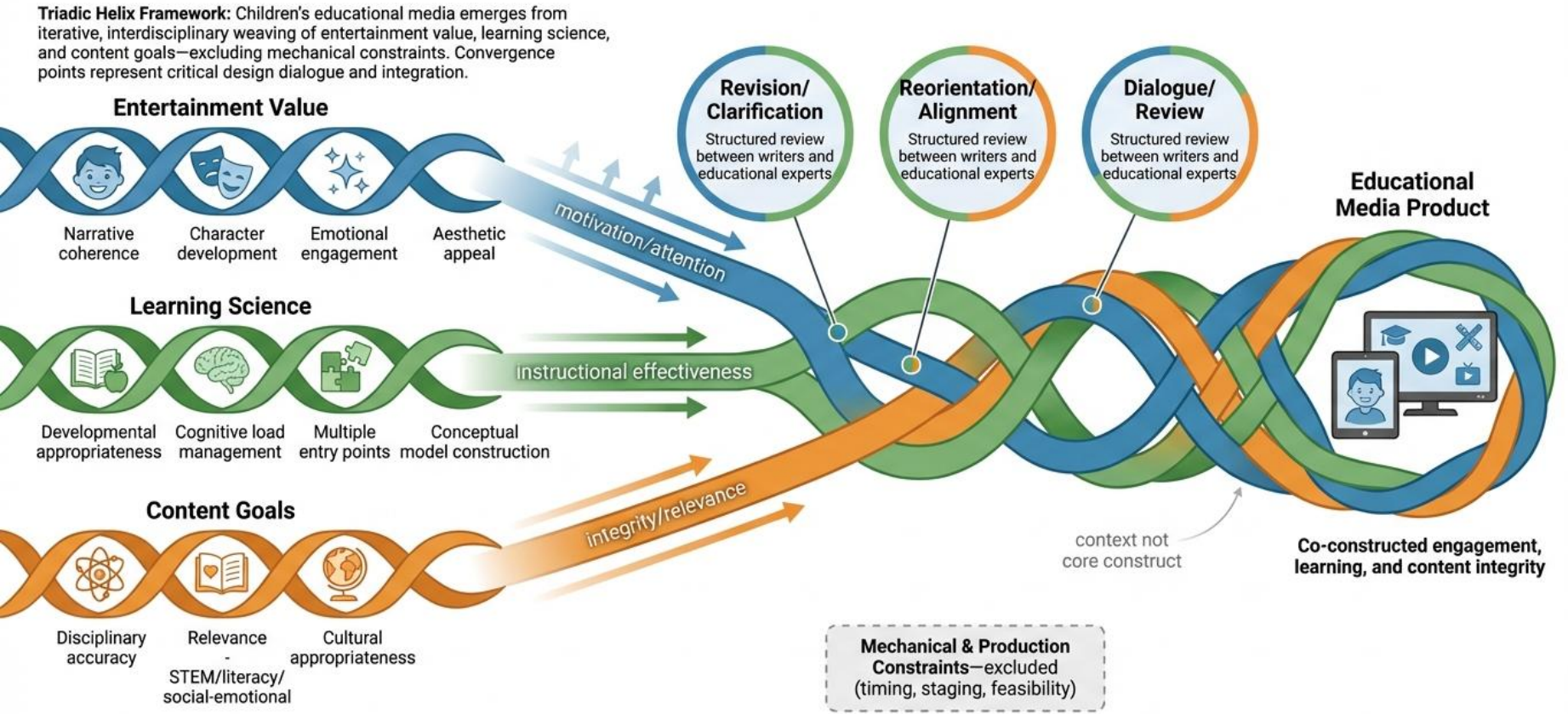
a) The characters in the stories will discover that mixed gender collaboration allows for different perspectives which helps to solve problems.



NSF 4. Creating Affinity Groups Based on Science/Engineering Practices

a) Model how children of all gender identities may choose to work together based on the value they hold for engaging in science and engineering practices (rather than gender-related activities). Show that the kids are friends because of their shared love of STEM topics.

Negotiating Educational Value in Children's Media: A Design-Cycle Framework for Educational Productions



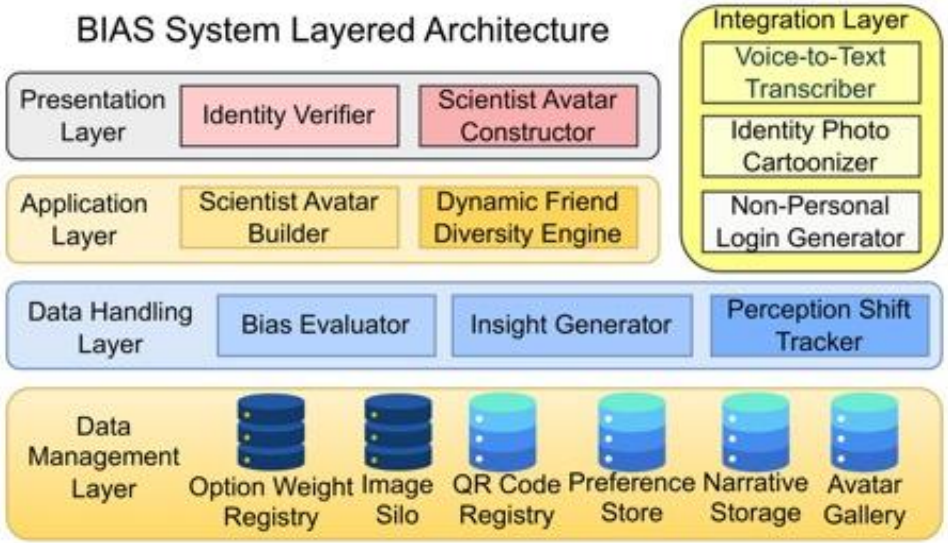
Collaboration is Key

The 6 minute video has been removed. To request access please email sara_sweetman@uri.edu and state the purpose you would like to use the video.

Thank you!

Digitizing the DAST while leveraging user interactivity and automated backend reporting

DIGI-DAST (https://ddast.uri.edu/aisl-demo/)

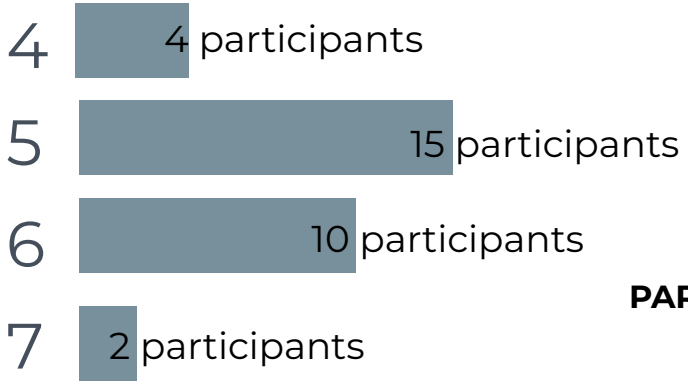


(Guy et al., 2023; Hayes et al., 2020)

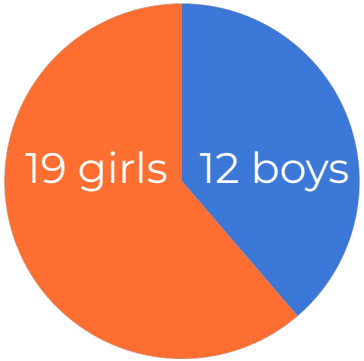
PARTICIPANTS

31 children/**27** families

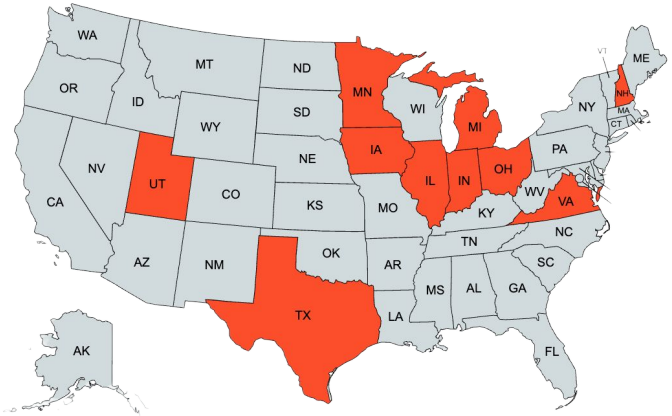
PARTICIPANT AGES



PARTICIPANT GENDERS



PARTICIPANT LOCATIONS: 10 states



Participant 29_Digi...

Participant 29_Pap...

Participant 30_Digi...

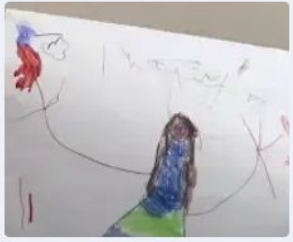
Participant 30_Dra...

Participant 26_Digi...

Participant 26_Pap...

Participant 22_Digit...

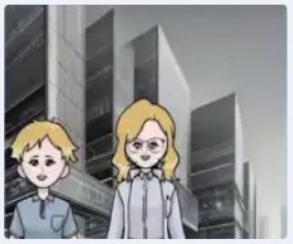
Participant 22_Pap...



Participant 23 Digit...

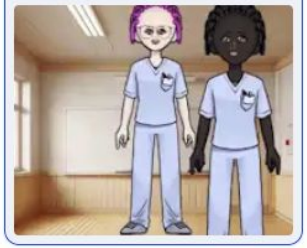
Participant 23 Pape...

Participant 24_Digi...



Participant 24_Pap...

Participant 11_Digit...



Participant 11_Pape...

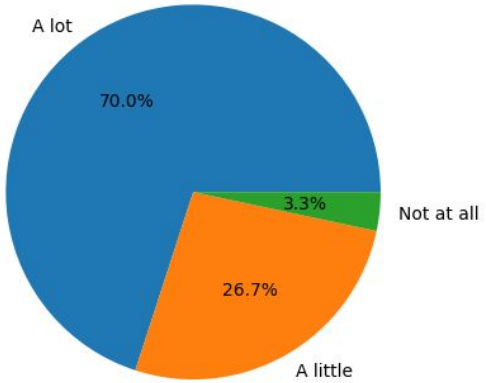
Participant 12 digit...

Participant 12 pape...

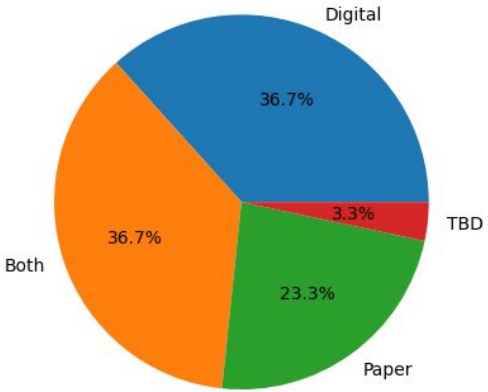
Participant 14 Digit...

Participant 14 Pape...

Was it fun to create a scientist using this tool?



Which drawing best represents what you see in your mind?



- On the whole, participants seemed to be able to **successfully create** digital scientists fairly easily and they were generally **satisfied** with their creations.
- Parents expressed appreciation for the fact that customization options were **limited** and **therefore weren't overwhelming** for children.
- Participants often expressed a desire to **pick tools and other items** for their digital scientist to **hold** (including beakers, test tubes with "potions", other tools, clipboards)
- The **switch from taping to dragging mechanic** for selection of a partner/collaborator stumped some at first, but they quickly adapted

Report will provide

Does the participant perceive…

Science as % sensational, traditional, and contemporary

Science is Collaborative: yes/no

Scientists collaborate with someone same or different: % of features similar/ different from

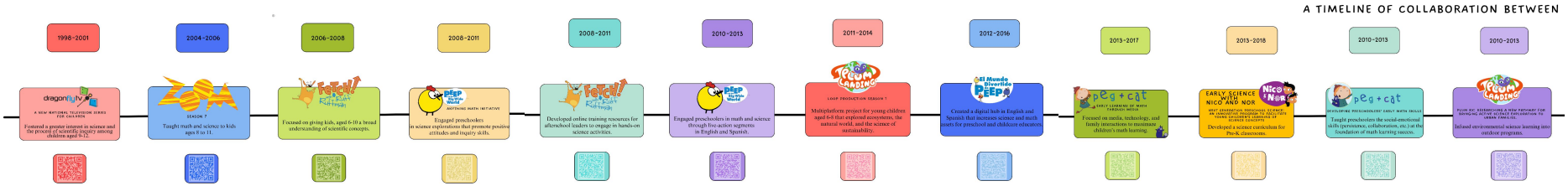
Scientists who look like them (self-concept): % of like features to own avatar

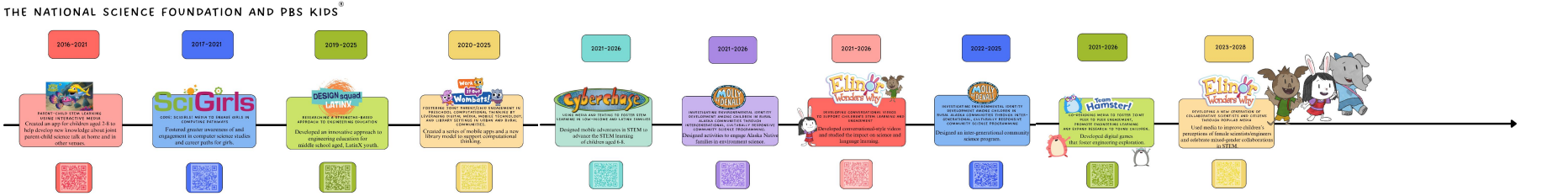
Reflection

Think back to the scientist you imagined at the start of the presentation. Is there anything you would change or add to the image in your imagination?

Share in chat or unmute to verbally share your ideas?

Our own Surprise Finding is that the measurement tool is really good at broadening perceptions.





Timeline of NSF funded children's media