

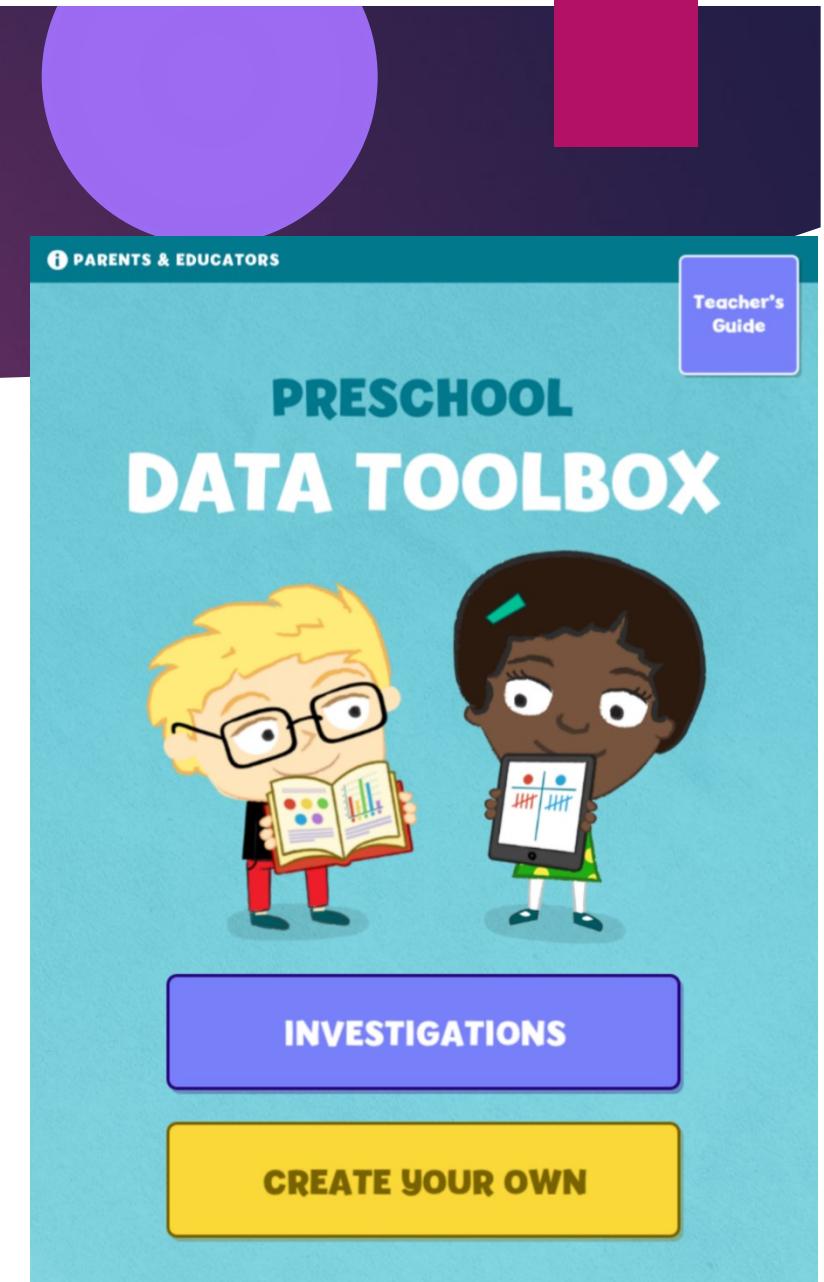
Exploring Preschool Data Collection and Analysis: A Formative Study

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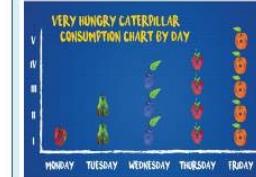
Connecting CT and DCA

- Computational Thinking (CT) is a systematic way to break down complex problems in order to answer a question or reach a goal
- Data Collection and Analysis (DCA) is at the intersection of math and CT
 - Counting, sorting, classifying, comparing, ordering
 - Creating and comparing data representations (like graphs and tally charts!) to communicate information and answer research questions

Limited Research on and Instructional Materials for DCA

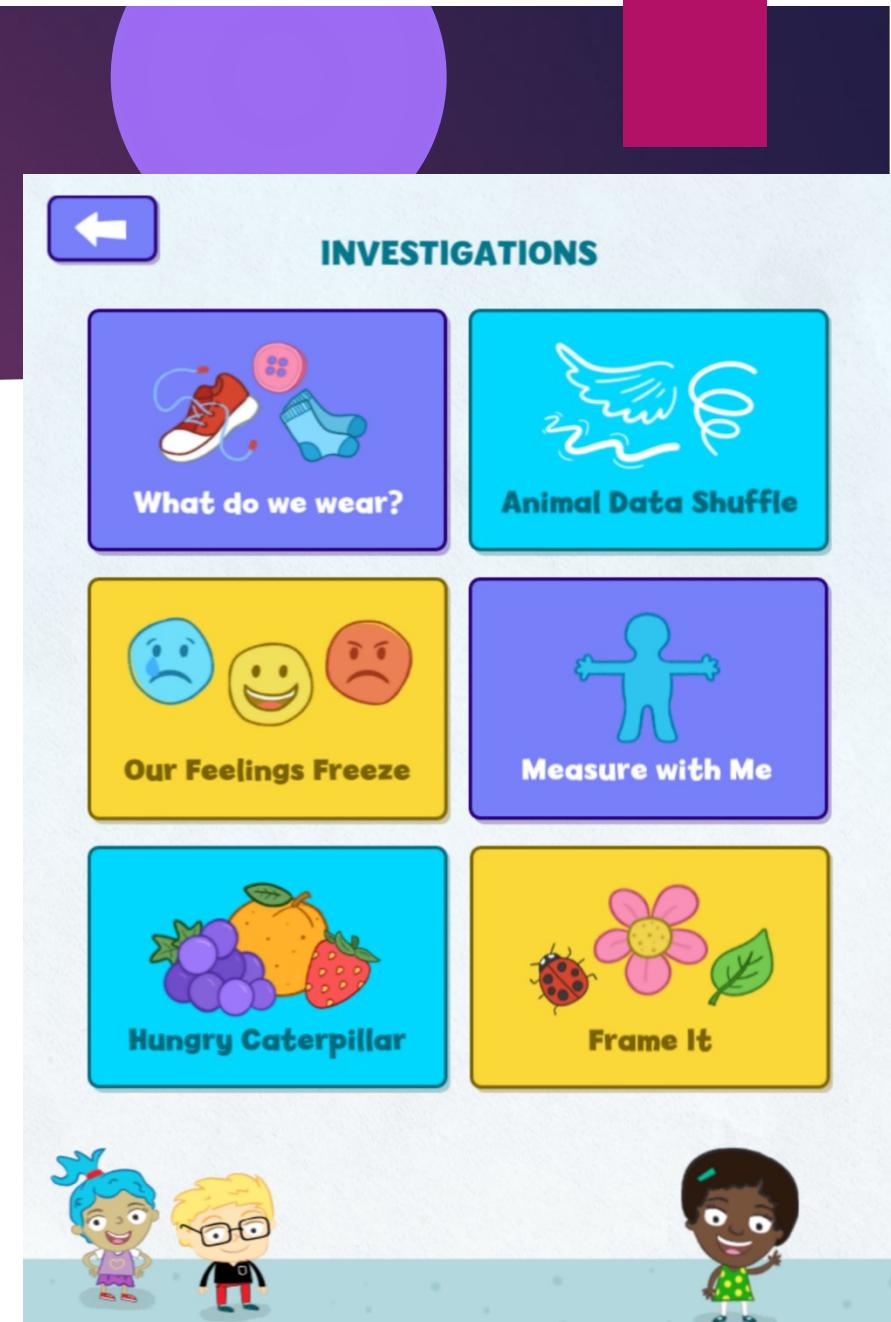
- BUT research is limited as to:
 - ↳ how preschoolers should collect and analyze data to solve real-world problems
 - ↳ how to support preschool teachers' instruction around DCA
- AND there remains a lack of fun, high-quality materials that support children's DCA skills

Graph & Chart Types

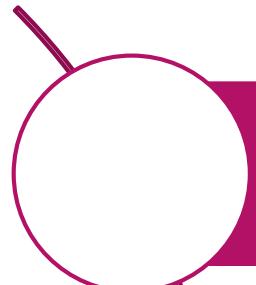
Pictograph	Object Graph	Body Graph
 A pictograph titled "VERY HUNGRY CATERPILLAR CONSUMPTION CHART BY DAY". The y-axis is labeled with numbers 1 through 5. The x-axis lists the days of the week: Monday, Tuesday, Wednesday, Thursday, and Friday. Each day has a caterpillar icon above a stack of fruit icons. The data shows the caterpillar consumes 1 fruit on Monday, 2 on Tuesday, 3 on Wednesday, 4 on Thursday, and 5 on Friday.	 An object graph on a grid. The y-axis is labeled 1, 2, 3, 4, 5. The x-axis is labeled Mon, Tues, Weds, Thurs, Fri. Colored pom-poms are placed on the grid at the intersections of the days and numbers. For example, there are 4 yellow pom-poms on Monday at the 4 level.	 A photograph of children standing on orange mats in a classroom setting, representing a body graph where children's physical presence is used to collect data.

The Preschool DCA Intervention

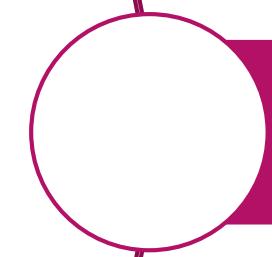
- ▶ Use 9 **data-focused "investigations"**
- ▶ Goal is to foster **preschool mathematics** and **computational thinking (CT) skills** in a developmentally appropriate and fun way
- ▶ Leverage teacher-facing app



Preschool DCA Intervention Parts



6 Existing Lessons



2 Create Your Own



1 Design a Data Story

Supporting Children's DCA skills

- ◀ Our investigations help children represent data with **concrete objects** (including standing and physically representing their own data point) and **transitioning to pictures, numbers, or symbols**
- ◀ Digital tools scaffold data collection, organization, and representation



App Scaffolds Consistent Investigations Steps

Ask or Think
about
Research
Question

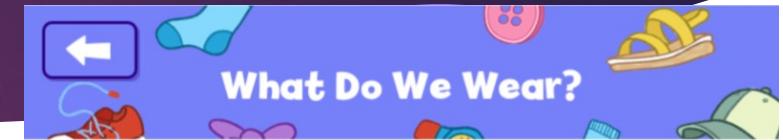
Collect &
Organize
Data

Analyze Data

Interpret
Data (i.e.
Data Talks)

Example: What Do We Wear? Investigation

This investigation uses attributes (or characteristics) of clothing to sort groups, create a graph, and discuss data.



Session 1

SELECT A RESEARCH QUESTION:

	Do you have a zipper?
	Do you have a button?
	Are you wearing socks?
	What is on your shoes?
	What do we use to dress up when we play make believe?

Example: App Screens

What Do We Wear?

Session 1

SELECT A RESEARCH QUESTION:

- Do you have a zipper?
- Do you have a button?
- Are you wearing socks?
- What is on your shoes?
- What do we use to dress up when we play make believe?

Interpret

Do you have a zipper?

Choose 2-7 Items

Interpret

Draw

Sort

Search

Do you have a zipper?

10	
9	
8	
7	Zipper
6	Zipper
5	Zipper
4	Zipper X
3	Zipper X
2	Zipper X
1	Zipper X
	Zipper X

Interpret

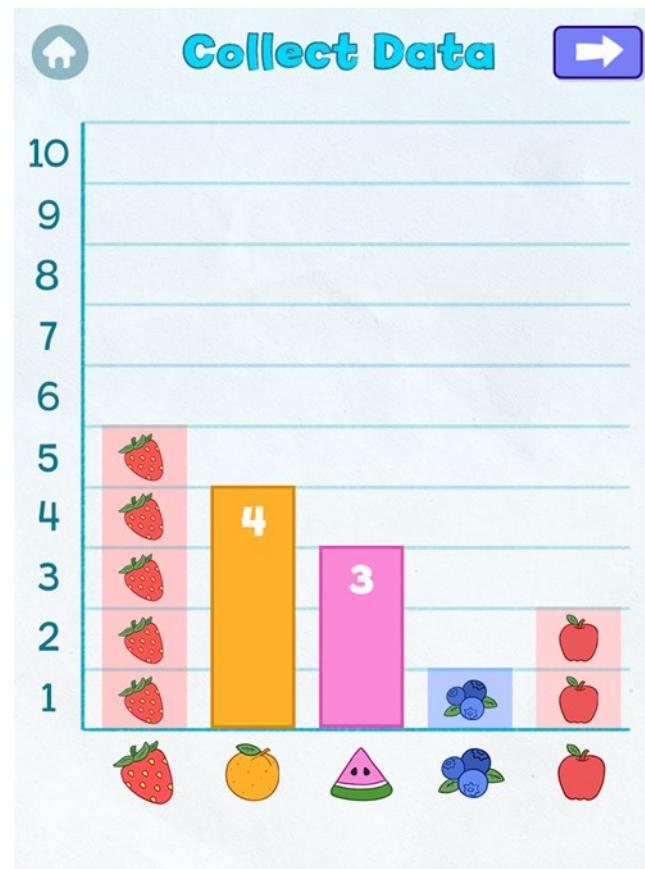
Draw

Sort

Search

Study 1: Data Collection

- ▶ First in a series of studies.
- ▶ Using a design-based research approach.
- ▶ Preschool Teacher completed:
 - ▶ Interview (n=10)
 - ▶ Survey (n=19)
- ▶ Participants viewed a series of PowerPoint slides with short videos demonstrating each investigation.



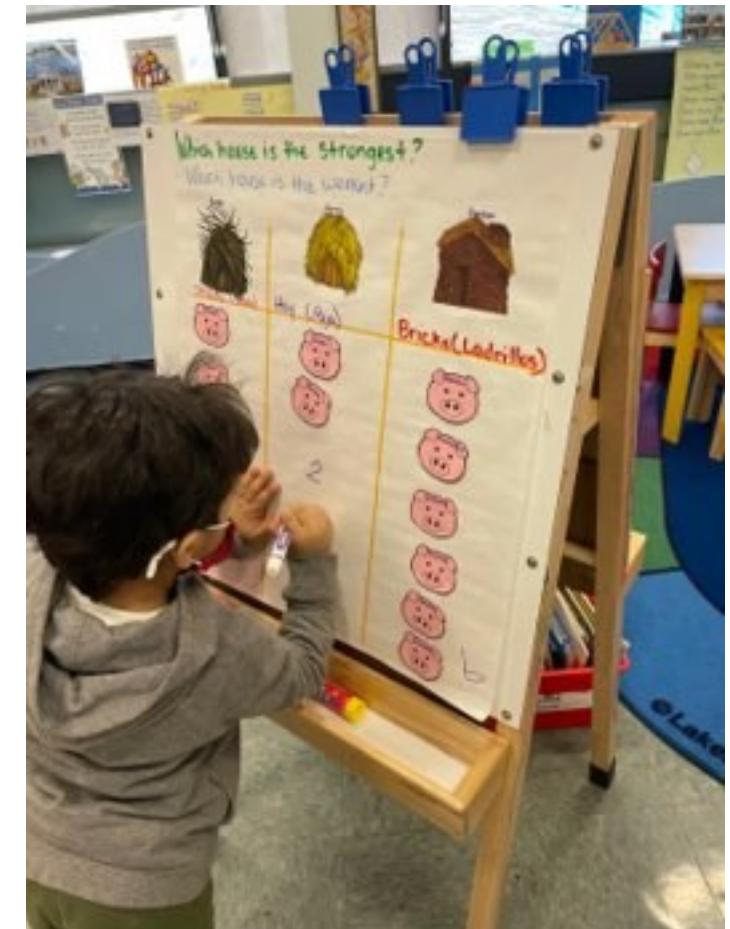
Findings - 1

- ▶ The **integration of mathematics and DCA** are welcome additions to the preschool classroom.
- ▶ It builds on and extends what children are already learning.



Findings - 2

- ▶ Teachers positive about our suggested activities because they
 - ▶ Included many hands-on components
 - ▶ Included multiple visual representation
 - ▶ Engaging children in play-based activities with real-world characteristics



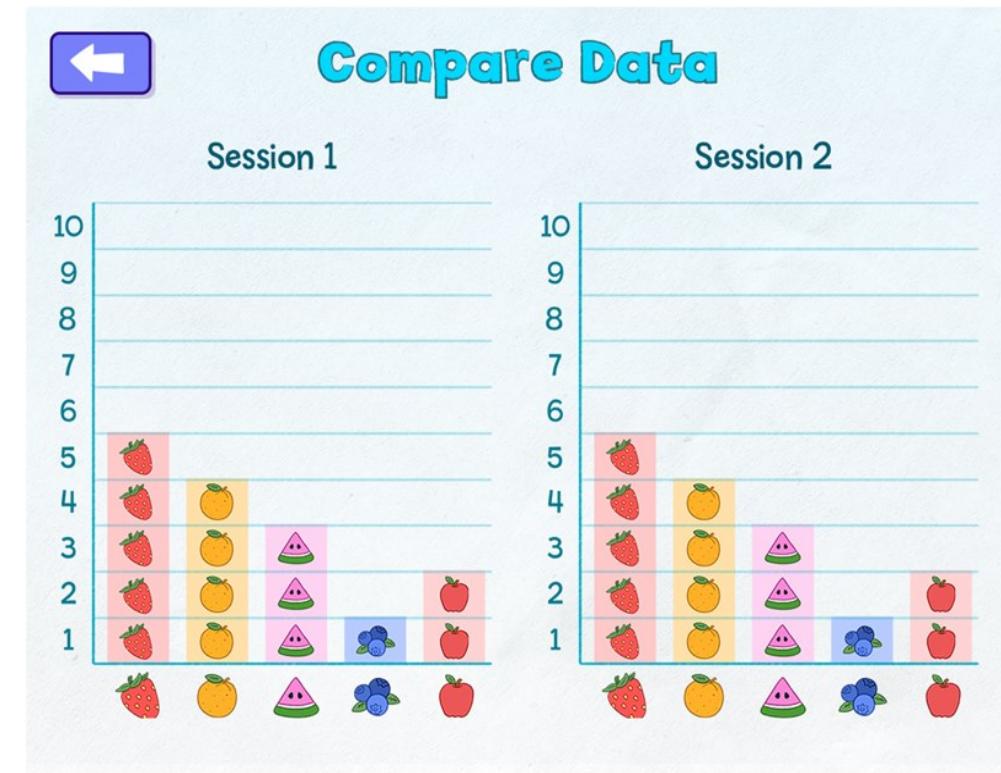
Findings – 3

- ▶ **Developmentally appropriate.**
- ▶ **Adaptable.** Can be adapted based on the age (3-5 years) and readiness of children in the class
- ▶ **Scaffolding.** Yet, Scaffolding remains critically important!



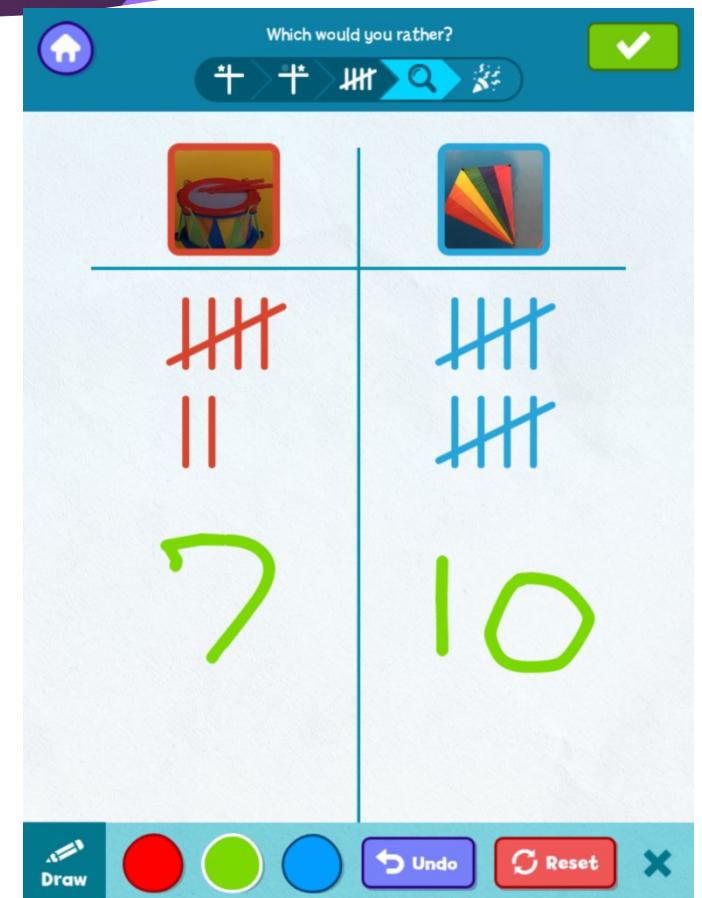
Findings - 4

- ▶ Teachers anticipated some **DCA content** would be more challenging than other content.
 - ▶ Least Challenging: sorting, representing data
 - ▶ Moderately Challenging: making predictions
 - ▶ Most challenging: interpreting and discussing data



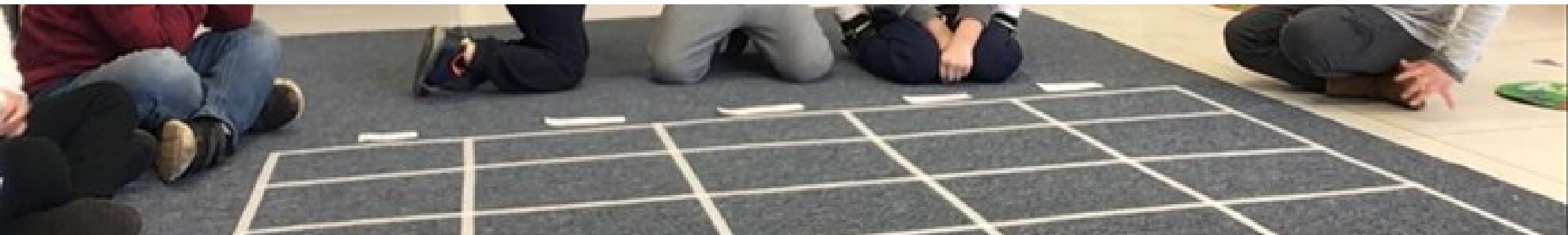
Findings – 5

- ▶ **Materials preparation and activity pacing** was reasonable in terms of space, materials, and time.
- ▶ **Technology provides unique affordances** to create meaningful learning opportunities.
- ▶ Example affordances include features such as: Camera, Drawing, and Sorting features.



Conclusion

- ▶ DCA intervention likely to make a meaningful contribution to preschool classrooms, adding important math and CT content that is not currently included in preschool classrooms.
- ▶ Intervention supports current math learning goals and extends them.
- ▶ Content adaptable for wide range of ages (3-5) and ability levels.
- ▶ App provides unique affordances that are not typically available to preschool teachers and children.



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