Preschoolers as Problem Solvers: Integrating Computational Thinking with Mathematics and Science

Ximena Dominguez\textsuperscript{a}, Danae Kamdar\textsuperscript{a}, & Shuchi Grover\textsuperscript{b}

\textsuperscript{a}Digital Promise Global & \textsuperscript{b}Looking Glass Ventures

STEM+C Summit 2019
Background

• Build a knowledge base re:
  • which/how CT skills can be promoted in early childhood
  • whether/how CT can be integrated with mathematics and science

• Develop learning blueprints to guide the development of resources

• Design and pilot test prototype activities
  • identify design principles useful to future efforts integrating CT and mathematics/science in early childhood
Approach

- Focus on underserved communities
- Connect school and home learning
- Integrates hands-on experiences with digital apps
- Multidisciplinary team & inclusion of teachers/families → Co-Design
Co-Design/Research to date

• **Who?**
  - Learning Scientists (CT, Math, Science, Tech)
  - Developers
  - Advisors
  - Partner Teachers (n=3 teachers + n=1 coach)
  - Partner Families (n=4)

• **How?**
  - Brainstorming meetings to select CT content
  - Series of interactive co-design sessions
    - kicked off with “seed ideas”
    - looked for natural integrations with math/science
  - Pilot test in collaboration
    - researchers + partner teachers/families
CT Skills

• Problem Decomposition
  • resonated with teachers/parents but adults usually decomposed

• Algorithmic Thinking
  • looping as entry point vs sequences requires significant scaffolding

• Abstraction
  • not as impossible as several initially thought
CT Skills & Math

• Problem Decomposition
  • shapes
  • counting, cardinality, and comparison of quantities

• Abstraction
  • shapes
  • counting, cardinality, and comparison of quantities

• Algorithmic Thinking
  • visual spatial
  • counting, cardinality, and comparison of quantities
CT Skills & Science

• Problem Decomposition
  • experimentation and argumentation

• Abstraction
  • observation, description and sorting

• Algorithmic Thinking
Next Steps: Field Study (Fall 2019)

• PD and workshops
• 22 hands on-activities
• 2 digital apps

• Implementation data
• Observations in homes and classrooms
• Feedback interviews
• Assessments of learning (CT, math and science)
Thank you!

Questions orSuggestions? Contact us!

• Ximena Dominguez: xdominguez@digitalpromise.org
• Danae Kamdar: dkamdar@digitalpromise.org
• Shuchi Grover: shuchig@cs.stanford.edu