Integrating Science with Mathematics and Engineering: Linking Home and School Learning for Young Learners

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Presentation Team

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Project Description

Participatory Design: Educators, families, researchers, and curriculum and software developers co-design and evaluate resources to promote preschool STEM teaching and learning

Goal: Extend the Early Science with Nico & Nor™ curricular program developed as part of a previous NSF project to:

- purposefully link science with engineering and mathematics
- create a home-school connection component building on families' funds of knowledge and,
- develop resources that address the needs and strengths of multilingual, Latinx families

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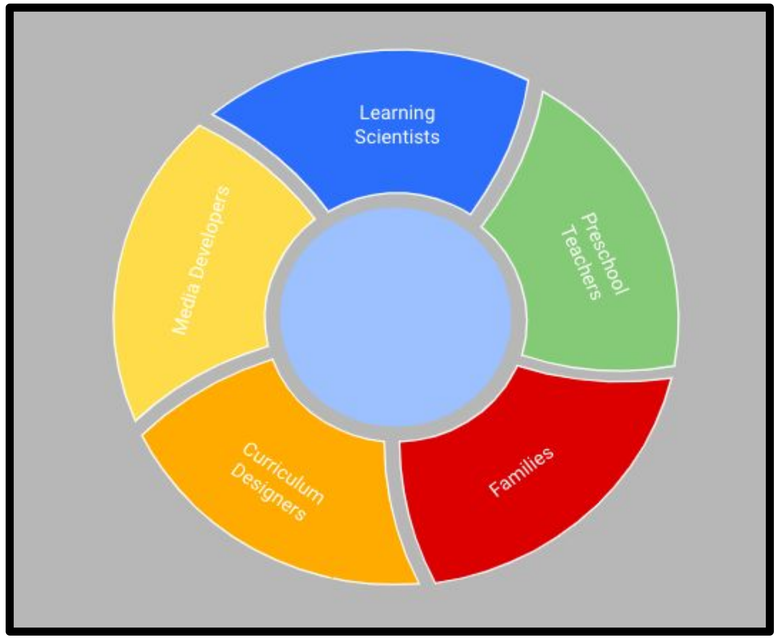
Study Design

Co-design Phase

- design and test activities that connect science with engineering and math and build on children's local context and experiences in their communities
- identify synergies/principles for connecting science with engineering and math
- examine issues of cultural and linguistic equivalence



User and Pilot Studies

- test/refine resources in classrooms and homes in collaboration with partner teachers and families

Field Study

- examine implementation in classrooms and homes and examine teaching and learning outcomes

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Initial Findings - Math

Linking Science with Math

- Families and educators identified synergies between **science** and **math concepts that are often promoted in preschool** such as counting and cardinality as well as multiple **math concepts that are less often promoted** in preschool, such as measurement and visual spatial skills.

- Science provided **meaningful** opportunities for children to engage in mathematics (e.g., engage in measurement as they observed plants grow or learn visual spatial language when exploring light and shadows).

- **Both mathematics and science needed to be scaffolded in order to achieve mutual support**, especially with mathematics that are less commonly promoted in preschool classrooms.

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Activity Examples - Math

Children measured plants to document growth over time

App to scaffold measurement of different kinds of vegetables in different orientations

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Initial Findings - Engineering

Linking Science with Engineering

- Overall, families and teachers reported feeling **less familiar with engineering** but after discussing engineering during co-design, they were **able to identify multiple instances in which they naturally engage in engineering design** in the classroom and at home
    - Families identified instances when they engaged in engineering practices
        - Ex: Mom who sewed curtains for friend and family described how she brainstormed, planned and revised designs
        - Ex: Families designed trellises to help tomatoes grow healthily and placed nets to protect animals
    - Teachers identified instances when children discussed engineering principles
        - Ex: Children designed ramps and pathways purposefully in the block area

- Team has explored i**ntegrating engineering at the beginning** (to initiate exploration) and **end** (once children understand some science ideas) of units

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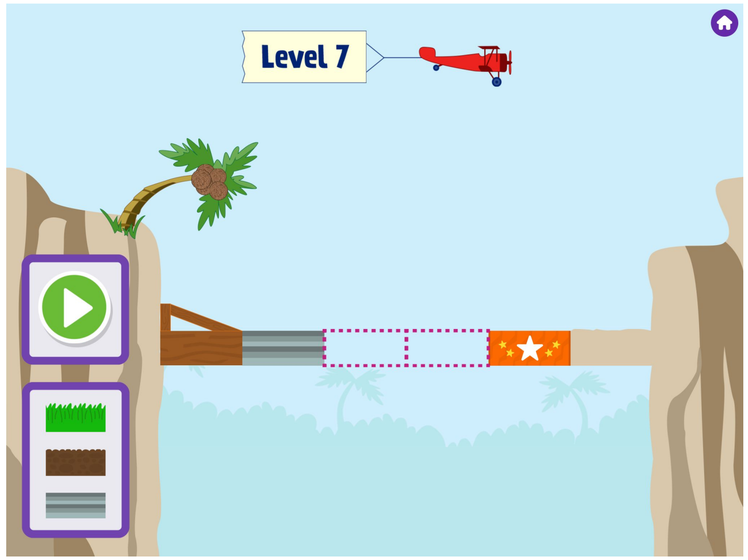
Activity Highlights - Engineering

Children investigating how objects move on ramps of different textures

Children use different materials to design and build support for a model tomato plant. They test and revise to determine which designs help support the floppy plant.

Engineering App that invites children to easily test and revise designs to get coconuts to roll to a desired location using pathways of different textures



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Thank you for joining today!

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