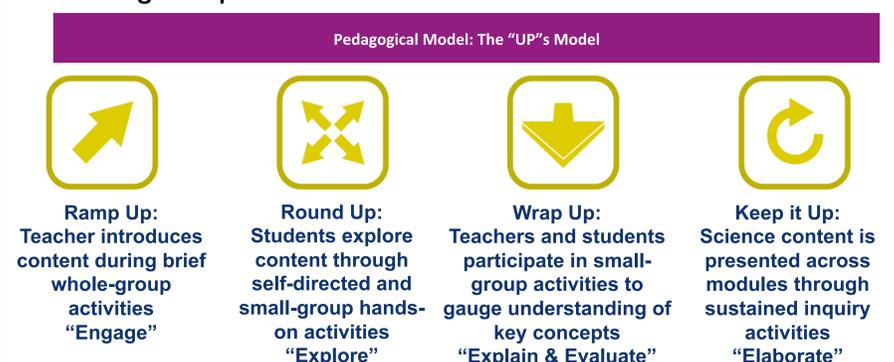


## STEM in Preschool

- Preschool is an important developmental period in which children acquire essential cognitive and social skills that serve as the foundation for future success (Bowman, Donovan, & Burns, 2000)
- Research has shown that high quality science instruction needs to start in the early years (Gerde, Schacter, & Wasik, 2013)
- Young children need:
  - Opportunities to learn content and skills important for future science learning (Conezio & French, 2002)
  - Exposure to inquiry-based approaches that capitalize on their curiosity about their world (Brenneman, Stevenson-Boyd, & Frede, 2009)
- Exploring science concepts through inquiry is associated with science achievement, language and literacy skills, and domain-general skills (Hong, Torquati, & Molfese, 2013)

## The Early Explorer Model

- The pedagogical model is rooted in constructivism, where children learn by constructing knowledge gained from hands-on experiences and social interaction (Minner, Levy, & Century, 2010)
- Learning takes place in four stages, adapted from the 5E inquiry model of instruction (Bybee et al., 2006), with the majority of the time spent on children exploring STEM content and concepts through meaningful exploration



## Implementation Study

- Partnership with Waco Independent School District (WISD) to conduct a year-long implementation study
- WISD preK teachers receive curriculum, materials kits, big books, and professional development sequence
- Qualitative data collection consists of teacher interviews, surveys, classroom observations, and lesson logs
- 51 classrooms:
  - 65% traditional PreK
  - 20% Bilingual PreK
  - 15% Montessori
  - 24% receiving Head Start funding
- 1,100 preschool students
  - Hispanic (58%) and African American (29%)
  - 88% economically disadvantaged
  - 39% of students identified as English language learners
- Purpose of study: To examine implementation at a large scale and evaluate necessary support for teachers



## STEMscopes™ EARLY EXPLORER

- An inquiry-based preschool curriculum that integrates science, math, engineering, and literacy to promote skills across multiple domains of school readiness
- Written and developed by early childhood, instructional, and curricular experts in preschool science and literacy
- Aligned to standards that encompass:
  - National Head Start standards
  - Several state preschool science standards, including Texas, Florida, New Jersey, and Massachusetts
  - NGSS Kindergarten Science and Engineering Practices and Cross-Cutting Concepts
- Designed to be flexible and to complement common preschool daily schedules and classroom structures (e.g., circle time, free play, small group, centers)
- Primary goal: To make STEM education accessible and easy for preschool teachers to implement
- Curriculum consists of:
  - 12 modules that encompass Physical, Earth/Space, and Life Science
  - Hands-on center-based activities across domains:

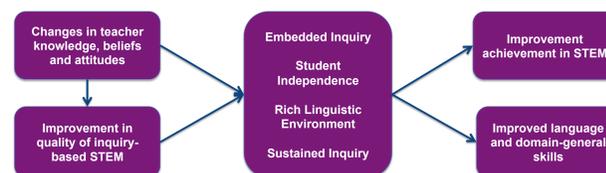
Science	Math	Engineering	Literacy	Observation
Dramatic Play	World of Science	Writing	Puppet	Color
Art	Sensory Table	Fine Motor	Gross Motor	Sustained Inquiry

- Fiction and Non-Fiction science big books:



## Theory of Change

- Inputs: STEMscopes Early Explorer curriculum, materials, and PD



## Professional Development

- Professional development was developed based on research identifying best practices (Dash et al., 2012; Desimone, 2009):
  - Content-specific and coherent
  - Requiring active learning from participants
  - Available over an extended period of time
- PD combines training on science content through the curriculum itself as well as training on specific pedagogy related to inquiry-based science in early childhood
- PD sequence includes:

August	September	November	January	March	May
Curriculum Launch	Cooperative Learning	Family & Community Involvement	Curriculum Re-Launch	Quality Questioning	Capacity Building
Centers-based Learning	Sustained Inquiry	Student-Teacher Relationships	Vocabulary in Context	Literacy & Science	

## Initial Results and Future Work

- Teacher Interviews and Surveys:
  - Successful integration with district curriculum/structures
  - Ramp Up and Round Up first to be implemented
  - Wrap Up and Keep it Up last to be implemented
  - Lesson planning with digital content difficult for PreK
- Fall Classroom Observations:
  - Significant discussion between teachers and students
  - Room for improvement for utilizing higher level questioning
  - Early Explorer implemented throughout day in whole group, small group, and center time
- Lesson Logs:
  - Non-fiction big books and vocabulary cards most popular component
  - Usage of Round Up Centers:

Most Used Centers	Least Used Centers
Writing (63%)	Puppet (23%)
Literacy (61%)	World of Science (23%)
Science (56%)	Dramatic Play (30%)
Color (55%)	Observation (33%)
Art (51%)	Sustained Inquiry (34%)
Math (49%)	Sensory (35%)
Fine Motor (46%)	Engineering (37%)

- Future work:
  - Translate the face-to-face PD to an online PD program to create a scalable program to reach broader audience
  - Enhance vertical alignment of Early Explorer with STEMscopes K-12 curriculum programs
  - Strengthen supports for ELLs to support language and literacy develop in context of science
  - Quantitative followup in 2015-2016 school year in second year of implementation