

Bridging Preschool and Kindergarten Science: Exploring Play-based Engagement with Scientific and Engineering Practices in Early Learning Environments (SciEPlay Project)

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Young children are natural scientists, eager to explore and pose questions about their surrounding environments (Eshach & Fried, 2005; Gopnik, 2012; Greenfield, 2017; National Research Council, 2007). Children make sense of the world through play, providing the fundamental classroom set-up for exemplary science learning (Bulunuz, 2013; Tunnicliffe 2021). The role of play as a fundamental component of child development is recognized internationally (Howes & Smith 1995; Author, 2020; Norodahl & Johannesson 2016; Pellegrini 2011; Weldemariam 2014), yet science in early childhood education is, in practice, often directed by an adult and structured around a particular table or “station” in a classroom. The SciEPlay Project has a unique focus on STEM learning occurring in early education classrooms. With two primary components, identifying student engagements in science and professional learning (PL) sessions geared toward play based curriculum, this project has a goal to investigate play based STEM learning across preschool and kindergarten spaces in addition to providing educators with tools to recognize that young students are interacting with science and engineering practices outlined by the Next Generation Science Standards (NGSS) and the Framework for K-12 Science Education (NGSS Lead States, 2013; Framework).

A mixed methods, design based research methodology is being utilized to answer the following research questions: (1) What are the key design elements of the SciEPOP tool and the surrounding professional learning experiences needed to support student engagement with science and engineering practices? (2) How does the use of the SciEPOP tool during professional learning progressively enhance teachers’ abilities to support children’s engagement with SEP in play? (3) How does the proposed teacher professional learning intervention impact classroom-level patterns of children’s engagement with science and engineering practices during play? (4) How does the proposed teacher professional learning intervention impact site and classroom-level knowledge and attitudes about SEP during play?

As a member of the research team in Year 2, there has been a focus on protocol and instrument development, data collection and cleaning, codebook development, coding, and with an imminent shift toward data analysis. Data collection consisted of classroom video observation data as well as interview transcripts that were spliced or refined respectively. Classroom observation data is the biggest feat as we had 11 participating teachers and more than 60 hours of video data to be analyzed. As of July, we have established three way intercoder reliability, >0.80 , using the validated SciEPOP app to code 10% of the classroom observation data. SciEPOP (Science and Engineering Practices Observation Protocol) app houses the codebook made up of the NGSS Practices and levels for each practice (emergent, intermediate, and exemplar), crosscutting concepts, and pedagogical codes that was established in 2018 by Drs. Alison Miller and Lauren Poniatowski. Coding for the remainder observation hours is set to be completed by mid September.

Most recently, I had the opportunity to work directly with Dr. Poniatowski to develop a codebook for teacher exit tickets, which were completed by the attending teachers across the 11 PL sessions. Major themes across the codebook included: shifts in understanding in terms of play, science, challenges/barriers and science and engineering practices, application of NGSS, and applying PL tools into practice. The codebook was finalized and uploaded to coding software Dedoose, and as of July exit tickets have been successfully coded. In the coming months, the research team will have a heavy focus on coding video and interview data to prepare for the second cohort of teachers starting on the project in October and the culmination of Year 3 of the project.

Faculty Mentor: Dr. Alison R. Miller

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