

Exploring Scientific and Engineering Practices in Preschoolers' Play

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This project investigated the ways in which free play facilitates science, technology, engineering, and math (STEM) learning in preschool-aged children. Additionally, we explored the roles teachers as well as classroom environments played in fostering or hindering scientific and engineering practices. Over the course of the 2018-2019 academic year, we collected over 100 hours of video data from four preschool sites in Maine in order to identify cases of STEM engagement.

Our summer work mainly revolved around using NVivo software to pinpoint, transcribe, and code interactions that aligned with eight different scientific and engineering practices. We also coded exchanges between students and teachers that occurred in conjunction with STEM practices. The instrument utilized to identify STEM engagement was developed by Professor Miller, adapted from the eight Next Generation Science Standards (NGSS) science and engineering practices in order to better capture the emergence of STEM learning in preschool environments.

Throughout the coding process, we have noticed patterns regarding teacher interactions and classroom environments that influence a child's ability to engage in scientific and engineering practices in play. Certain teacher behaviors such as direct instruction or disruption of play due to perceived risk serve to inhibit the emergence of scientific and engineering practices. When teachers interrupt children to ask questions or engage in conversation, the child tends to shift their attention away from play to focus on the adult figure. Although disruptions due to safety concerns are sometimes necessary, when teachers are overly cautious, they prevent students from taking risks and exploring. There is a greater frequency and variety of STEM practices during outdoor sessions in which there is less structure and the children are allowed more unrestrictive and undisrupted play. Preschool-aged children are also more likely to engage in richer play when they are presented with non-representative toys. Objects such as toy trucks and dolls often restrict preschoolers from engaging in play beyond what the items represent whereas elements such as branches and mud typically allow for more inquiry and creativity.

Over the summer, we submitted two proposals surrounding this research to the American Educational Research Association (AERA). One proposal outlined the findings regarding the scientific and engineering practices in the present research. The other proposal was a continuation of my Spring 2019 independent study which utilized this project's data to investigate gender differences in teacher disruptions in play. Moving forward, we will run a full analysis on all the data we have collected to observe patterns across all four seasons at the four preschools. With our findings, we hope to contribute to professional development aimed at helping educators better foster STEM learning in preschoolers' play.

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