

Editorial

Play, Problem-Solving, STEM Conceptions, and Efficacy in STEM: An Introduction to the STEM in Early Childhood Education Special Issue

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This Special Issue of Education Sciences focuses on STEM in Early Childhood Education. The development of science, technology, engineering, and mathematics (STEM) curricula varies in quality in the early childhood years, making STEM instructions inconsistent between and within different preschool and early elementary grade levels. Given that fundamental STEM reasoning and thinking are established in early education, this lack of curricula development and the uneven manner in which it is deployed is problematic. In this Special Issue, we invited educators and scholars to identify some of the most compelling research examining STEM curricula development and submit a research manuscript.

In short, this Special Issue includes three main themes wherein (1) play and authentic problem solving is at the center of young children's STEM development, (2) children's conceptions of STEM professionals are examined in dynamic ways explain equitable access to STEM fields, and (3) teachers' efficacy in Early Childhood STEM are examined. These articles describe challenges and opportunities that are just emerging in the early childhood classroom. To examine these topics in more detail, we provide an overview of our discussion of each of these three themes.

1. Play and Authentic Problem Solving

STEM is often examined with young children's engagement with tablets and software. However, the research designs from Bofferding et al. [1], Hollestein et al. [2], Lewis Presser et al. [3], and Welch et al.'s [4] studies used concrete play at the center of young children's STEM engagement and development, suggesting the importance authentic socially constructed realities that children create for play and problem-solving should be leveraged more often in Early Childhood classrooms. Findings evidenced emergent development of young children's activities, and provided variance of initial perturbations, access points, teacher collaboration, and teacher facilitation in STEM. Critical to all of these articles are the integrated approaches that the teachers, scholars, and children drew from when engaged with play during STEM learning opportunities. More work needs to be done to examine the impact these integrated, informal approaches have on varying populations. By drawing from varied populations and varying school and informal learning structures, scholars can better inform curricula development in equitable and inclusive manners wherein young children's cultural experiences are the center of their STEM development.

2. Children's Conceptions of STEM Professionals

Many of the scholars who examined children's conceptions of STEM professionals, considered how the impact of their conceptions might have an impact on equitable access points for young children in STEM fields. For instance, by conceiving of an engineer or a scientist as being represented by more female or diverse people, young children, who are often marginalized in STEM fields, are more readily able to envision themselves in



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these STEM fields. Findings from these studies [5–7] imply that educators can intervene in young children’s schooling experience to leverage more diverse conceptions of STEM professionals. Findings also suggest that experiences with STEM professionals outside of school can also impact how young children conceptualize STEM professionals. Interestingly, these findings suggested that implicit biases were often addressed when young children were given opportunities to learn how STEM professionals created designs, analyzed data, built or improved things, and/or engaged in COVID-19 discussions. By considering these conceptions in such a dynamic way, it would be interesting to examine how young children’s conceptions change over long periods of time; allowing educators a clearer understanding of the long-term outcomes early childhood experiences have on children’s future professional goals.

3. Teachers’ Efficacy in Early Childhood STEM

Finally, many of these articles examine teachers’ perceptions, instruction, and efficacy when teaching Early Childhood STEM. Essentially, findings suggest there is much to learn about relationships between teachers’ dispositions when teaching, planning, and using particular planning tools. These studies [8–10] drew from models that took up comprehensive relationships between early childhood teachers’ dispositions, planning actions, and teaching actions. For instance, by examining early childhood teachers’ planning dispositions and planning actions, Burton et al. [9] found these two phenomena are not necessarily directly related. Baroody et al.’s [8] examination of early childhood teachers’ use of a learning trajectory suggested that teachers were more efficacious when using a learning trajectory compared to those using a “Teach-to-Target” or “Skip-Level” approach. Finally, foci that included social justice frames introduced interesting questions regarding such comprehensive pedagogical content knowledge development [10]. Given the multifaceted aspect of this theme and the uneven educational experiences educators have globally in early childhood classrooms, there is much to be known about these phenomena.

4. Conclusions

These ten articles [1–10] demonstrate the depth of Early Childhood Education and STEM-related topics. In fact, it is critical to consider how important play, puzzles, and everyday experiences are in STEM instruction. Moreover, to promote equitable access to STEM, findings from these studies demonstrate young children’s need to imagine themselves engaging with these activities and see themselves represented. Finally, educators have to do the heavy lifting when determining how to position inquiry in their planning and make in-the-moment decisions. By examining tools that promote instructional efficacy, learning trajectories may need to be revised to allow better instructional use in the early childhood STEM classroom. Thus, the varying tasks, actors, and formal/informal spaces require more attention in the STEM early childhood classroom. These articles contribute meaningfully to this field as we progress with such multi-faceted work and foci.

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