Chapter 40
Designing and Implementing Inclusive STEM Activities for Early Childhood

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ABSTRACT

This chapter provides a rationale for high quality STEM experiences in inclusive early childhood (EC) classrooms, describes what high quality STEM experiences are and why they can be an ideal context for supporting the development of young children with special needs and dual language learners. The authors offer recommendations concerning how to plan and implement STEM learning centers to support the meaningful participation of all children using a tiered perspective that includes the framework of Universal Design for Learning. Ideas and resources for how teachers can plan STEM learning centers, integrate literacy and arts, and interact in ways to support the engagement of all children, especially those with special needs and dual language learners are shared. These strategies are recognized as best practices, and adhere to position statements endorsed by NAEYC and the recommended practices developed by the Division for Early Childhood of the Council for Exceptional Children (DEC, 2014).

INTRODUCTION

All young children with disabilities should have access to inclusive high-quality early childhood programs, where they are provided with individualized and appropriate support in meeting high expectations. (U.S. Departments of Education and Health and Human Services, 2015)

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A person cannot open a newspaper, browse an online news outlet, or turn on a cable news program without encountering at least one reference to STEM (science, technology, engineering and mathematics). We are being told that our country faces a crisis in STEM, that we need more students to enter the STEM pipeline, and that the way we teach STEM is sorely lacking (National Research Council, 2007). All of this may indeed be true. But we have seen these calls before. Some may remember the crisis when the Soviet Union "beat" the US into space in 1957 with Sputnik, the first artificial satellite. The recent call to action from the National Academy of Sciences, National Academy of Engineering, and Institute of Medicine, *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future* (National Academy of Sciences, 2007) drew attention to the national shortage of STEM teachers and professionals, and called on educators to rethink how STEM content is taught in our nation's schools. Several volumes followed, and in 2013, the National Research Council released the final draft of new national standards for science education: the Next Generation Science Standards (NGSS 2013; National Research Council, 2012).

Missing from these new standards is any reference to children younger than 5 years of age (the NGSS are explicitly written for K-12 education). In addition, scant attention is paid to providing authentic, accessible STEM experiences for children with disabilities. However, the increased attention on STEM for *all* students provides timely impetus for shining a light on how STEM curriculum is being implemented in inclusive early childhood programs. The field of early education varies greatly both in the extent to which young children are given access to these experiences and in the quality of those experiences. This chapter will address both of these issues.

This chapter is divided into two sections. The first section provides a rationale for high quality STEM experiences in inclusive early childhood (EC) classrooms, including a description of what high quality STEM experiences are and why they can be an ideal context for supporting the development of young children with special needs and dual language learners. The second section offers recommendations for teachers and administrators concerning how to plan and implement STEM learning centers to support the meaningful participation of all children using a tiered perspective that includes the framework of Universal Design for Learning. The objectives of this chapter are to provide early childhood educators with ideas and resources for how teachers can plan STEM learning centers, integrate literacy and arts, and interact in ways to support the engagement of all children, especially those with special needs and dual language learners. To illustrate these ideas, classroom vignettes and teacher perspectives are shared.

BACKGROUND

We know that young children are actively involved in reasoning about STEM content, beginning at birth. They are intensely curious about how the world works, and they bring this wonder and curiosity to new experiences, continually building theories to help them make sense of the world and how it works. However, when it comes to educational contexts, young children's ability to reason scientifically is vastly underestimated (National Research Council, 2007).

Although the term STEM is an acronym that represents four distinct domains (science, technology, engineering, and mathematics), it is also more than the sum of its parts. STEM in its ideal sense is a multidisciplinary approach to learning about the natural and human-made world that embraces knowledge, practices, concepts, and attitudes. In this section, we attempt to both break STEM apart and show