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**Dailey, D., & Cotabish, A. (Eds.). (2016). *Engineering instruction for high-ability learners in K-8 classrooms*. Waco, TX: Prufrock Press.**

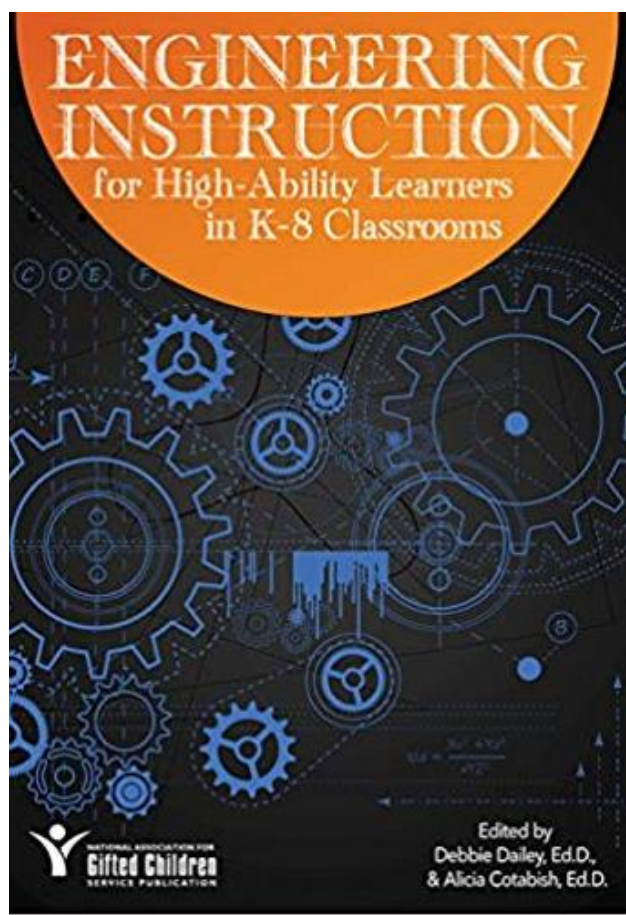
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The book, *Engineering Instruction for High-Ability Learners in K-8 Classrooms*, edited by Debbie Dailey and Alicia Cotabish, provides promise to the many K-8 educators and administrators who are searching for resources and practical ideas to implement in their classrooms to help close the STEM education gap. Their book begins with evidence-based research that supports engineering education for students in grades K-8. Thirteen rich and engaging chapters provide practical and descriptive examples that STEM educators will find intriguing. This book is a must read for all educators and administrators interested in STEM education. Although the title indicates a specific focus on high-ability learners, the authors offer ideas, strategies, resources, and recommendations that are perfectly suited, or can be easily adapted, for all learners.

According to the authors, approximately 80% of the fastest growing jobs in the United States currently require a strong background in STEM, and this demand for highly qualified workers is only expected to grow. The reasons for this national trend are many, and school systems with more traditional curricula have not kept pace with the growing need for skills



and talents demanded by STEM fields. Twenty-first century students are entering the workforce and college classrooms ill prepared for the rigors of highly technical jobs or higher learning. What can be done to alleviate this growing gap between our economic needs and current student preparation practices? There are no easy answers, and viable solutions can be found in different environments. It is encouraging that many schools across the country have awakened to this challenge and are actively working to implement STEM programming. Evidence of impact can be found across all school types, including, public, private, and charter schools. Similarly, impact can be found across schools in varied socio-economic settings and performance levels. Despite overall progress in STEM education, few programs have successfully addressed the E, engineering, in STEM. While some educators propose that the field of engineering is too rigorous for the youngest learners, the authors of this book do an impressive job of making engineering seem not only practical, but also accessible for all learners.

Next Generation Science Standards (NGSS) experts contribute chapters that are rich in practical and thoughtful ideas designed to help administrators and practitioners develop engaging classroom lessons focused on engineering content. One appealing feature of the book is how complex engineering standards are broken down into more straightforward and manageable parts.

Book sections are organized in a way that groups chapters across common themes, a format that flows well and supports both easy reading and use as a reference resource. After a compelling introduction, the first section includes key components of engineering instruction and covers relevant background context and supporting evidence aligned with instructional practices and integrated curriculum. Chapters include discussions on the integration of engineering with

mathematics or the arts, the use of robotics, and concepts of innovation, inventiveness, and creativity. Section two includes examples of innovative learning practices including 3-D printing, computer science, project-based learning, and maker space concepts. Section three focuses on how to design curriculum through integration of core subjects and assessments. Finally, section four outlines important approaches to professional development for preparing teachers to engage in engineering instruction and includes the importance of engaging school leaders in the process. Beyond these comprehensive sections, two appendices are included with lists of resources and examples of engineering in formal and informal environments.

Individual chapters include a wide range of material, each with references and resources with the potential to lessen the many challenges faced by schools trying to implement rigorous STEM programming. Chapter summaries include conclusions and key considerations. In addition to background, many chapters offer practical tips and techniques for teachers as they work on implementing engineering practices into their lessons. For example, in Chapter 6, Jason Trumble shares information about using 3-D printing in the classroom. He provides a comprehensive description and history of 3-D printing before delving into practical tips and ideas about incorporating 3-D printing in the classroom using NGSS science and engineering processes. He suggests that it is not enough to simply add new technology like digital fabrication to the classroom. Instead, teachers need to actually redesign student learning. The work required to achieve this goal is not an easy undertaking; it is complex and difficult. However, it is ultimately well worth the investment of time and effort because it creates deeper learning experiences for students and stronger foundations in science and engineering practices. The author then offers classroom vignettes to illustrate how 3-D printing can be incorporated into

curriculum with real-world application. Teachers can adapt these vignettes to fit their curriculum and different learning environments.

Another example from Chapter 9 presents a scenario from a fictional classroom. Having just participated in professional learning about integrating science and engineering standards into her lessons, second-grade teacher Miss Smith recognizes her lesson plan on plants is inadequate. Specifically, she notices that her lesson plan does not comply with NGSS requirements. Like a story, this chapter walks the reader through actual steps the teacher takes to enhance her lesson plan about what plants need to grow. Working to increase the complexity and depth of the lesson, the fictional teacher “begins with thinking about how to give her students more *voice* and *choice* with this lesson” (p. 126). The author then describes in detail how a better lesson plan can be constructed by adding essential questions, hands-on investigations, and assessment elements. Before and after lesson plans are also provided for review.

The many examples and strategies included throughout the book help engineering and other STEM subjects appeal to a wide audience that includes both novice and seasoned practitioners. The authors achieve this goal, not by simplifying content or lessening the rigor and intensity of engineering, but by offering realistic, user-

friendly strategies, scenarios, and engaging resources and ideas. By making engineering accessible to teachers, the authors help make engineering accessible to students. As students are exposed to more integrated, rigorous, and relevant learning, most will embrace expectations. Instead of exclusion, it makes more sense to approach the rigorous content of STEM as inclusive and open to all students. Higher aptitude and gifted children may have a greater inclination for rigorous engineering concepts and may be more likely to embrace higher learning opportunities in STEM fields, but all children will benefit and grow from an introduction to engineering principles.

Engineering, the E in STEM, is often overlooked as too abstract or complex for students in grades K-8. In *Engineering instruction for high-ability learners in K-8 classroom*, the authors take on this challenge, emphasizing not only the importance of engineering in STEM curriculum but also the need to introduce engineering concepts to young children. With an abundance of natural curiosity and their innate love of play and discovery, young children are equipped to embrace engineering concepts. When these concepts are appropriately designed to support developmental needs of young children, we can expect positive outcomes in learning. This book is well written, provides a nice combination of background and practical content, and places engineering within reach for new and experienced practitioners alike.

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## About the Reviewer


**Tryna Knox** is a second-year PhD student at Southern Methodist University, studying STEM education. Formerly, she was an engineer in the healthcare industry, a business and management consultant, a classroom teacher, an elementary assistant principal, and a regional administrator for a public charter school system.



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