

# FOREWORD

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*Seldom has a book been as desperately needed as this* indispensable resource from Bush and Cook is today. STEM education is a current priority for many policy makers, business and industry leaders, philanthropic foundations, and education leaders. There are good reasons for this. Data indicate there will be continued growth in the number of STEM jobs the economy will generate, while at the same time there is concern the country is not producing sufficient numbers of STEM graduates.

As a result, the pressure is on educators to implement STEM programs beginning in elementary school to expose and motivate students at a young age to pursue STEM careers. The problem is that in the rush to implement STEM programs, the effort is seldom done with the intentionality necessary to positively affect student learning. Bush and Cook solve this problem by providing elementary teachers and leaders a comprehensive road map for intentionally designing, implementing, and assessing STEAM inquiries in the classroom so that STEAM education can become the vehicle through which students' mathematics and science achievement is increased. Importantly, the authors demonstrate that effectively integrating mathematics and science standards in contextually meaningful ways through STEAM investigations can transcend the individual disciplines while simultaneously promoting deep conceptual learning of both.

Bush and Cook accomplish this through a laserlike focus on mathematics and science content and practice standards, research-informed instructional strategies, and an overriding commitment to equity throughout. The importance of the authors' argument that all STEAM planning must begin with alignment to and focus on the mathematics and science content and practice standards cannot be overstated. In tying STEAM to foundational mathematics and science standards, Bush and Cook make the critical and frequently overlooked points that not every mathematics or science lesson has to be a STEAM inquiry, that a separate STEAM curriculum is both unnecessary and not even advisable, and that foundational mathematics and science instruction remain an essential feature of effective STEAM programs.

All too often in STEAM programs, students randomly engage in disjointed "arts and crafts" activities involving technology that dominates rather than

complements, or merely “tinker” and “make” as Bush and Cook point out, while failing to learn necessary grade-level mathematics and science content standards or engage in the science and engineering or mathematical practice standards. No number of fun activities or shiny objects will ever overcome this fatal flaw of so many STEM/STEAM programs. The authors’ approach to STEAM, with their emphasis on maintaining the integrity of the mathematics and science standards, no matter what your state or provincial standards are, ensures that you and your students will not fall victim to this fatal flaw.

The authors correctly and strongly argue that STEAM is for each and every student and therefore is preferably implemented in the regular elementary classroom or in a STEAM lab of which each and every student is a part. STEAM does not need to be, nor should it be, an add-on—one more thing to do in an already overcrowded curriculum—or reserved as an enrichment or gifted program for only the select few. As Bush and Cook point out, students who struggle in mathematics or science are the very students who benefit most from the contextualized learning and open-ended tasks that STEAM investigations make possible. By specifically expanding STEM to STEAM, to meaningfully include the arts, the authors engage teachers and students in the creativity of mathematics and science learning and address the importance of aesthetics, emotion, and empathy in problem solving—all constructs that are desperately needed in both the classroom and society today.

Bush and Cook offer either a problem-based learning or a design thinking framework for structuring STEAM investigations. The design thinking framework is particularly timely. Traditionally, mathematics and science education have emphasized their importance in the curriculum to the nation’s economic competitiveness or national defense interests. Recently, however, the National Council of Teachers of Mathematics (NCTM; 2018) has argued that the reasons for teaching and learning mathematics (and science) must be broadened to ensure students are empowered by mathematics to understand, critique, and improve the world, as well as experience the joy, wonder, and beauty of mathematics. The design thinking framework, with its specific emphasis on improving conditions in the world, serves this important overall goal of education.

Throughout this book, Bush and Cook provide concrete frameworks, discussion and reflection questions, tested classroom examples, and comprehensive exemplars to bring their recommendations to life for classroom teachers and leaders. Grounded in the research as well as their

experiences collaborating with real teachers and leaders in the classroom, their recommendations aren't something you simply read. *Step Into STEAM* is an interactive resource you engage in with your colleagues and community partners to collaboratively transform the classroom experience for students.

This is the book I wish I had written! I encourage you to engage with Bush and Cook's deeply insightful and proven approach to STEAM education and to heed their call to action: Leverage their approach to STEAM so that you become the teacher of STEAM your students deserve, and more importantly, your students become inspired and creative problem solvers who are empowered to not only improve their own lives but improve the society we inhabit as well.

—Matt Larson, PhD

Past President, National Council of Teachers of Mathematics (NCTM)  
Interim Assistant to the Superintendent for Instruction  
Lincoln Public Schools, Nebraska

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