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Appendix

STEM Awareness and Exploration

STEM education can be described as an inquiry-based, interdisciplinary approach where students apply content knowledge, collaborate, communicate, create, and use critical thinking to solve real-world problems. They also learn about careers in the areas of science, technology, engineering, and mathematics.

STEM stands for science, technology, engineering, and mathematics. You may even see the acronym STEAM, which adds the arts, or STREAM, which adds reading. No matter the acronym, it is not the content from each discipline that makes a challenge or an activity *STEM*. **STEM is a way of thinking.** STEM challenges should be student-centered, hands-on, and an open-ended application of learning that results in a solution to a problem, such as an artifact or a process.

While it *will* take some effort, you *can* implement STEM practices. Your students and their future teachers and employers will thank you for it. Your efforts will impact students' lives—the choices they make, the jobs they seek and get, *and* their attitudes toward learning and failing in your classroom and beyond.

As a teacher, you naturally find ways to build knowledge in individual disciplines and make connections between those disciplines. You find ways to make content relevant to students. You modify lessons to meet the needs of each learner in your classroom. You design lessons, combining knowledge and practice, based on the interests of your students. Being a STEM teacher is not that different. Our hope is that this book will help you integrate STEM into your classroom.

As educators, our desire is to create experiences that encourage students to learn and explore while gaining knowledge that can be applied further. We work to prepare students to be successful in life and the careers they choose; to think critically; and to be able to solve problems at personal, local, national, and even international levels.

Many schools have STEM programs, but often STEM practices are not fully integrated into the school day or learning. In order to nurture STEM skills and attitudes, we must begin as early as preschool to make STEM practices the norm. Excluding these STEM practices in classrooms is a disservice to the developing minds of our young people (Hanson, 2014).

In a report on emerging technologies, the Institute for the Future concluded from input gathered from experts in various technological fields that "around 85% of the jobs that today's learners will be doing in 2030 haven't been invented yet" (2017, p. 14). The ability to apply science, technology, engineering, and mathematics knowledge will be essential to preparing students for jobs of the future, but it will not be enough. "A workforce prepared for the twenty-first century must be proficient in skills that include oral and written communication, critical thinking and problem-solving, professionalism and work ethic, teamwork and collaboration, working in diverse teams, applying technology, and leadership and project management" (Vasquez, Comer, & Villegas, 2017, p. xiii). We know that these skills do not come naturally—they can and should be taught and practiced so that our students can adapt to our ever-changing global and technology-driven workforce. With this in mind, we have woven throughout this resource the 21st century skill-building recommendations and pedagogical practices identified as critical to preparing students for new and emerging careers (NEA, n.d.). These skills when integrated into curricular plans foster students' ability to think critically and creatively problem solve while providing opportunities for working collaboratively and practicing communication skills—all of which are critical to engaging in success in STEM and problem- or project-based learning (PBL).