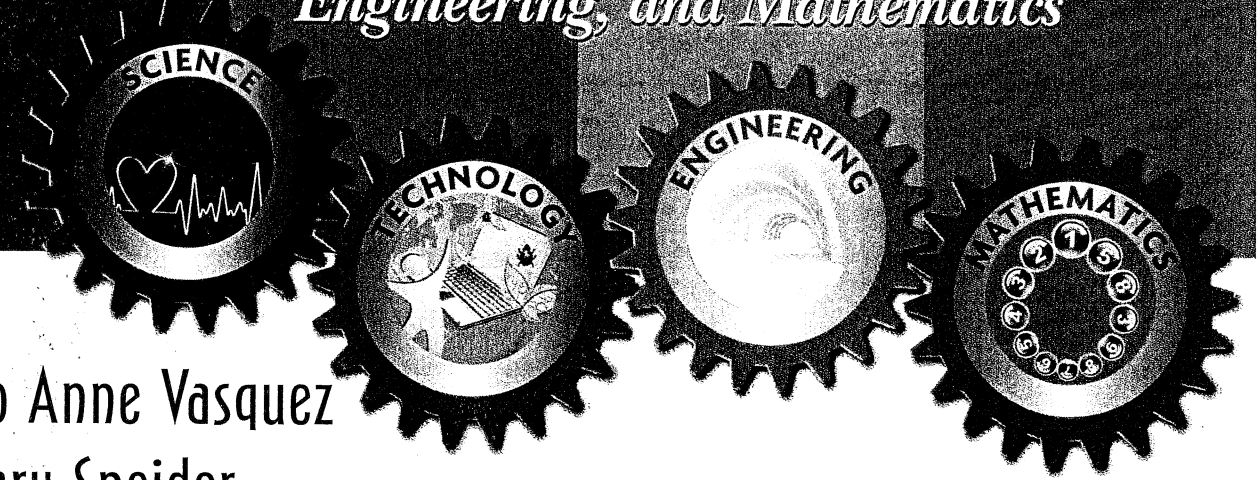
GRADES 3–8

Foreword author RODGER BYBEE

TEAM Lesson Essentials

Integrating Science, Technology, Engineering, and Mathematics



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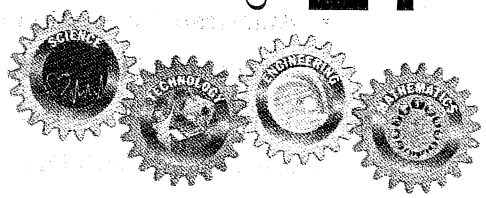
CHAPTER 17



Resources for Creating STEM Curricula

Good leaders, like good designers or good curators, recognize the rare skill of combining things together well. . . . There's a time to reinvent and a time to reuse, and the best minds know that both approaches have their place.

—"Stop Trying to Reinvent the Wheel," Scott Berkun (2010)

There are many exciting projects and lesson plans available on the Web for teaching and learning STEM at all grade levels. In many cases, you may find that the instructional materials you need have already been developed, and they only need to be adapted in small ways to meet the needs of your students. In other cases, you may need to do more development, but require some initial ideas to get started. This chapter suggests a few resources to help you on your way. Nearly all of these resources are available for free or low cost.

Obviously there are great organizations such as the National Science Teachers Association (www.nsta.org), and the National Council of Teachers of

Mathematics (www.nctm.org) are good beginning sites for STEM resources. Other great websites include:

- **American Association for the Advancement of Science (AAAS), Science NetLinks: http://sciencenetlinks.com**
  You will find K–12 lesson plans and information for planning new activities for Earth Day, National Chemistry Week, National Engineers Week.
- **ASCD Express: Preparing Students for a STEM-Filled World: www.ascd.org/ascd-express/vol6/624-toc.aspx**
  This issue of ASCD's Express features promising initiatives that seek to bridge the STEM content gap for both students and educators. The National Science Teachers Association (NSTA) offers advice and resources to help teachers engage their students in STEM subjects.
- **Discovery Education: www.discoveryeducation.com/teachers**
  Digital science and technology resources offer a rich, engaging, educational experience. Content is aligned with national standards and they have lesson plans that include objectives, materials, procedures, readings, and resources as well as assessment ideas. Don't miss the puzzlemaker application at www.discoveryeducation.com/free-puzzlemaker.
- **Edutopia: http://www.edutopia.org/groups**
  This site will get you started with project-based units and assessment ideas as well as other great tools and strategies for effective STEM teaching.
- **Federal Resources for Educational Excellence: http://free.ed.gov**
  This site provides projects related to oceanography, evolution, botany, and bioethics. They have ideas for building solar cars, lesson plans, games, homework assignments, and 150 math websites that are linked onto their site.
- **High-Quality STEM Education for English Learners: Current Challenges and Effective Practices: www.ncela.gwu.edu/meetings/stem forum/#panel**

The U.S. Department of Education's Office for English Language Acquisition hosted a forum on educating English learners in STEM fields. Visit the website to read materials from the conference and access to the speakers' presentations.

- **Intel Education's Design and Discovery Curriculum: http://educate.intel.com/en/designdiscovery**
  This site provides you with their design and discovery curriculum, which is free, with interdisciplinary and project-based learning projects already done for you. This curriculum is for students ages 11–15, though it can be adapted for lower grades. Intel STEM unit plans can be found at www.intel.com/about/corporate responsibility/education/k12/STEM Units.htm.
- **Khan Academy: www.khanacademy.org**
  The celebrated Khan Academy offers more than 2,700 instructional videos covering math, science, finance, and history. They are short instructional videos that may be appropriate to help build your own content knowledge.
- **The Museum of Science, Boston, Technology and Engineering Curriculum (TEC) Review: www.mos.org/tec**
  This site provides detailed reviews by experienced teachers of hundreds of instructional materials on technology and engineering, including many that are integrated with science and mathematics. A convenient search engine makes it possible to quickly search the database for materials by grade level, topic, or state standard alignments.
- **National Science Digital Library's K–6 Science refreshers: http://nsdl.org/refreshers/science**
  This site provides teachers with a quick review of science concepts. From weather to electricity to simple machines to paleoclimates, there are tons of minilessons and also modules, quizzes, and links to additional resources.
- **National STEM Video Game Challenge: http://stemchallenge.org**
  This site will help your students participate in a competition that will really motivate them. The website helps students learn about

game design and resources and then they can enter the national competition.

- **PBS Teachers STEM Education Resource Center: www.pbs.org/teachers/stem**

  With more than four thousand STEM resources available in its database, this website has a vast array of lesson plans, videos, and interactive resources to help you infuse both fun and rigor into your STEM lessons.

- **NASA's Planet Quest Exoplanet Exploration: http://planetquest.jpl.nasa.gov**

  Interested in space exploration? Learn from the experts about space exploration. This website is sponsored by NASA's Jet Propulsion Laboratory (JPL) and the California Institutes of Technology. The comprehensive, interactive Planet Quest website features spectacular images captured by NASA's Hubble Space Telescope; the Ask an Astronomer podcast; videos; classroom experiments; and JPL blog, which will take you inside a space mission. They also have a Digital Learning Network at www.nasa.gov/offices/education/programs/national/dln.

- **National Academy Press website: www.NAP.edu**

  This site includes many very useful reports from the National Research Council, most available for free download. For example, several reports that are especially relevant to STEM education include: *A Framework for K–12 Science Education: Practices, Crosscutting Concepts, and Core Ideas* (2012); *Taking Science to School: Learning and Teaching Science in Grades K–8* (2007); *Learning Science in Informal Settings: People, Places, and Pursuits* (2009); *Technologically Speaking: Why All Americans Need to Learn More About Technology* (2002); and *How People Learn: Brain, Mind, Experience, and School* (1999).

- **National Commission on Teaching and America's Future (NCTAF): http://jctaf.org/NCTAFReportNSFKnowledgeSynthesis.htm**

  The NCTAF released a report in collaboration with National Science Foundation (NSF) and WestEd entitled *STEM Teachers in Professional*

Learning Communities: From Good Teacher to Great Teaching. This report provides a two-year analysis of the research around what happens when STEM teachers work together in professional learning communities to improve teaching and increase student achievement.

- **Science, Technology, Engineering, and Mathematics (STEM) Education Coalition: www.stemedcoalition.org/**
  This organization works to support STEM programs for teachers and students at the U.S. Department of Education, the National Science Foundation, and other agencies that offer STEM-related programs. It represents all sectors of the technological workforce and is dedicated to ensuring quality STEM education at all levels. The website contains reference resources and reports on national and state STEM initiatives.
- **Science, Technology, Engineering, and Mathematics (STEM) Education Institute at the University of Massachusetts Amherst: http://umassk12.net/stem/**
  The Institute's work is to improve STEM education in K–12 and higher education. The website contains information on projects, educational resources, and teacher workshops.
- **Successful K–12 STEM Education: Identifying Effective Approaches in STEM, a study by the National Research Council: www.nap.edu**
  This report, available for a small fee from the National Academies Press website, outlines the indicators for a STEM-focused school, curriculum, and practices. It provides information to help make strategic decisions about improving STEM education within a system.
- **TEACH Engineering.org: http://www.teachengineering.org**
  This searchable, Web-based digital library collection is populated with standards-based engineering curricula including many with connections with mathematics and science disciplines. These resources for K–12 were developed by a collaborative of faculty from five universities and the American Society for Engineering Education, with funding from the NSF National Science Digital Library. The collection continues to grow and

evolve over time with new additions from other universities and input from teachers who use the curricula in their classrooms.

- **Thornberg Center for Space Exploration: www.tcse-k12.org**
  The mission of the Thornberg Center for Space Exploration is to inspire students and improve STEM education through the design and implementation of an international program on Space Exploration. A paper by David Thornberg posted on its website at http://www.tcse-k12.org/pages/stem.pdf makes a strong case for integration of the STEM disciplines.

REFERENCE

Berkun S. 2010. "Stop Trying to Reinvent the Wheel." *Bloomberg Business Week* June 2. Available at: www.businessweek.com/innovate/content/jun2010/id2010062_565850.htm.