



NEW EDITION



ENGINEERING THE FUTURE®

SCIENCE, TECHNOLOGY, AND THE DESIGN PROCESS

Engineering the Future® 2nd Edition is a set of four design-based project modules that can be taught as a one-year course or as four eight-week projects, that introduce students to the world of technology and engineering.

Three-Dimensional, Project-Based Learning

- *Engineering the Future* 2nd Edition (EtF) was produced by the National Center for Technological Literacy, Museum of Science, Boston and designed to fully support the *Next Generation Science Standards* (NGSS)¹ and Standards for Technological Literacy (STL)², as well as standards of many states.
- In EtF students explore how the crosscutting concepts of “energy and matter,” “systems and systems models,” and “structure and function” apply to a wide variety of problems.

Students Learn and Practice Like Engineers

- Student take on the role of engineers and apply the engineering design process to define and solve problems by inventing and improving products, processes, and systems.
- Students work to complete projects and activities and to read about practicing engineers.
- Students develop a deep and rich understanding of the term “technology” and understand how advances in technology affect human society and the environment.
- Student understand the complementary relationships among science, mathematics, technology, and engineering.

Total Support for Teachers

- Engineer’s Notebooks, Engineering Connections (readings), and Teacher’s Guides are available in both print and digital format.
- The Teacher’s Guides include project overviews, week-by-week lesson plans, and teaching suggestions.
- EtF provides a variety of assessment tools: in-class assessment, project rubrics, and end-of-project tests.
- An online support community moderated by an EtF author-team member allows teachers to access and share resources, troubleshoot with other teachers, and reflect on larger issues.



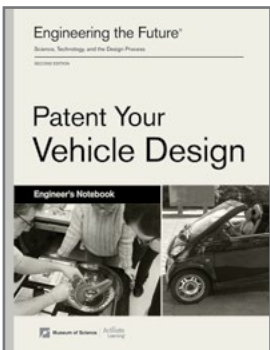
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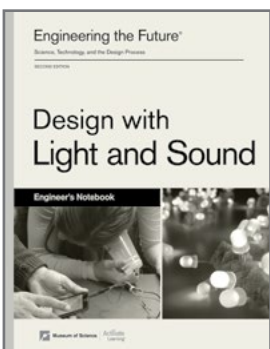
Jump Into Engineering engages students with a creative design project—to invent a mobile device accessory—on the first day. Later students learn the more systematic engineering design process. As in the prior edition, students learn to make orthographic and isometric scale drawings to develop skills in translating observations into mental models, which is the essence of “looking and drawing.” Building on successes from the maker movement, we expand on this in the second edition by adding 3 D Computer Aided Design (CAD). Students utilize CAD in a more authentic design process for the major project, to design an organizer to meet the needs of end users based on a survey that the students plan and conduct. The students select materials, create a CAD model of their design, and conduct a life cycle analysis and peer review, among other tasks.



Design a Green Building emphasizes building systems, such as mechanical, electrical, environmental, which students investigate one at a time, then later integrate into a model. In the second edition, students have open design choices for the building that they choose to develop, with an emphasis on understanding the needs of their community from a “smart growth” perspective. They use that as input to the engineering design process. As in the prior edition, students conduct experiments on various physical properties of materials, such as strength, elasticity, and thermal conductivity, to build skills in lab procedures and develop a hands-on understanding of various materials and their uses. In the later part of the project, given their experience in the prior project with digital CAD technology, students are able to use CAD to develop floor plans and an overall structure for their building with powerful visualization of the final designs.



Patent Your Vehicle Design begins with construction of a power steamboat, consistent with the “maker” approach and using a variety of hand tools and assembly techniques; but with the important addition of an inquiry process to figure out how it works through reverse engineering. And, as in the first edition, the students conduct a series of activities in hydraulics and pneumatics to learn how energy is transformed in heat engines and through various devices such as pneumatic pumps and hydraulic lifts. In contrast to the first edition, the culminating project provides much greater latitude for the teacher and students to apply what they learned to reverse engineer and improve a different transportation toy (such as a model plane or car).



Design With Light and Sound is significantly revised from the prior edition, while preserving several of the activities that were most engaging and informative to help students develop an adequate mental model of electricity. The new activities follow the constructivist “maker” theme to engage students in much deeper understanding of electricity and communications. Students begin the project with an exposure to basic electricity and electronic construction by inventing and making their own “LED gadgets” to learn the basics of electricity. This is followed with an introduction to sustainable energy sources such as wind and solar. The importance of energy storage is highlighted by students making their own emergency batteries from household materials. The project closes with electromagnetism, waves and communications, and the opportunity for students to design audio speaker systems and make FM radios to play music.

