REDE Resources List

Please send additional resources for this list to young@rice.edu so we can add them to our database. Last edit: 01/04/2010; JFY.

Primary Program Resources

Rice OWL-Space. https://owlspace-ccm.rice.edu/portal OWL-Space is Rice University's course and collaboration web tool. The REDE Community collaboration site provides resources and communication tools for the high school teachers participating in the Rice Engineering Design Experience; others interested in the program may apply for access.

E. Lumsdaine, M. Lumsdaine, and J. W. Shelnutt, *Creative Problem Solving and Engineering Design*: McGraw-Hill, 1995, ISBN: 0-07-236058-5. The purpose of this book is to enable engineers and technologists to be more innovative in conceptual design. Depending on the degree of emphasis placed on process (creative problem solving) or product (a rigorous yet innovative design project outcome) this text can be used for a variety of different ways: introductory courses (freshmen), multidisciplinary courses and team projects, senior capstone design; workshops for engineers and managers in industry and business. It shows that the creative problem solving process is rigorous, easily comprehensible and actually enjoyable. Practical real life examples are in abundance. A definite must have for all aspiring and practicing entrepreneurs.

J. L. Adams, *Conceptual Blockbusting: A Guide to Better Ideas*. Cambridge, MA: Basic Books, 2001, ISBN: 0-7382-0537-0. Integrating insights from the worlds of psychology, engineering, management, art, and philosophy, Adams identifies the key blocks (perceptual, emotional, cultural, environmental, intellectual, and expressive) that prevent us from realizing the full potential of our fertile minds. Employing unconventional exercises and other interactive elements, Adams shows individuals, teams, and organizations how to overcome these blocks, embrace alternative ways of thinking about complex problems, and celebrate the joy of creativity.

T. Markham, *Project Based Learning Handbook*: Buck Institute for Education, ISBN: 0-9740343-0-4. Guides teachers through all phases of successful PBL, from deciding on a project theme to reflecting on the outcomes of a project; designed to support both experienced and novice PBL teachers.

M. Boogaarts and others, *The LEGO® MINDSTORMS® NXT Idea Book*: No Starch Press, 2007, ISBN: 1-59327-150-6. Covers the fundamentals of programming and design, accompanied by CAD-style drawings and an abundance of screenshots that make it easy to master the MINDSTORMS® NXT system. Overview of the NXT parts (beams, sensors, axles, gears, and so on) and clear instructions for combining them

to build and program working robots. Delves into the complexities of the NXT programming language (NXT-G) and offers tips for designing and programming robots, using Bluetooth, and creating an NXT remote control. (Available at http://www.legoeducation.com/store/, Product ID: W991397.

D. Kee, *Classroom Activities for the Busy Teacher: NXT*. Cafe Press, 2008, ISBN: 978-0-9804785-0-1. Contains a 10-week set of lesson plans geared toward fifth- through 10th-grade teachers who want to implement robotics into their classroom. Each lesson is centered around one robot and includes a scenario with background information, equipment list, teacher notes, programming examples, reproducible student worksheets, and extension activities. Available at http://www.legoeducation.com/store/, Product ID: W991455.

Books & Articles

Design Concepts for Engineers, M. N. Horenstein (Prentice Hall, 2006, ISBN: 0-13-146499-X).

Engineering Design Process, Y. Haik (Thomson Brooks/Cole, 2003, ISBN: 0-534-38014-X). Has some nice sample design projects.

Engineering Design: A project-based introduction, C. L. Dym and P. Little (Wiley, 2000, ISBN: 0-471-28296-0).

Introduction to Engineering, P. H. Wright (2002, ISBN: 0-471-05920-X). General engineering introduction, not just design.

Tools and Tactics of Design, P. G. Dominick and others (Wiley, ISBN: 0-471-38648-0).

R. M. Felder, R. Leonard, and R. L. Porter, "Oh God, Not Another Teaching Workshop!," *Engineering Education,* vol. 79, pp. 622-624, September/October 1989 1989. Tips for designing and presenting workshops.

R. M. Felder, "On creating creative engineers," *Engineering Education,* vol. 77, pp. 222-227, 1987. Classroom exercises and assignments to help students develop and improve their creative thinking skills. Available on Felder's Web site (see below).

J. L. Kolodner, P. J. Camp, D. Crismond, B. PFasse, J. Gray, J. Holbrook, S. Puntambekar, and M. Ryan, "Problem-Based Learning Meets Case-Based Reasoning in the Middle-School Science Classroom: Putting Learning by Design Into Practice," *Journal of the Learning Sciences,* vol. 12, pp. 495-547, 2003.

Web Resources

American Institute of Chemical Engineers. http://www.aiche.org Global professional community for nearly 40,000 chemical engineers in 93 countries. AIChE provides members with technical resources as well as tools to manage their careers and lives.

American Society for Civil Engineers. http://content.asce.org/asceville/resources.html Resources to help guide our future civil engineers.

American Society of Mechanical Engineers.
http://www.asme.org/education/precollege/TeacherResources/ Workshops, guides, activities and other teaching resources related to mechanical engineering.

ASEE K-12 Engineering Center. www.egfi-k12.org Teachers have found ASEE's new K-12 engineering site useful for helping students determine the discipline of engineering they want to pursue. The site includes a bi-monthly e-newsletter for K-12 teachers with lesson plans and an e-newsletter for students to keep them plugged into engineering.

Autodesk. http://usa.autodesk.com Comprehensive pre-engineering, pre-architecture, and cross-discipline curriculum developed specifically for secondary schools.

Boston Museum of Science. http://www.mos.org/educators Promotes the learning and teaching of engineering and technology by elementary school students and teachers; classroom materials available. Check out the Classroom Resources tab, and the Technology and Engineering Resources page. They have "story" books for all age levels that are really great. See also Engineering is Elementary.

Building Big Educators' Guide.
http://www.pbs.org/wgbh/buildingbig/educator/act_index.html Flexible collection of fun, simple hands-on activities for fifth- to eighth-graders. You can use one or two activities or all of them to introduce kids to the basic physical science of large structures and the excitement of inquiry learning.

Center for Science Education Design It! http://www2.edc.org/cse/work/designit/ Extended design engineering activities challenge children to build and refine working models of small machines and toys over a period of 3-6 weeks. While engaging in the activities, children gain experience in physical science, problem solving, experimentation, and collaboration as well as practical familiarity with a wide range of safe, inexpensive, and commonly available construction materials.

Comprehensive Assessment of Team Member Effectiveness.
https://engineering.purdue.edu/CATME/index.htm The CATME website provides simple way to assess team members' performance in five areas that research has found to be very important for effective team functioning. The website collects ratings from team members and then produces summary reports for team members and administrators (such as course instructors or managers who use teamwork in their organizations).

Content Standards for Engineering in K-12 (NAE).
http://www8.nationalacademies.org/cp/projectview.aspx?key=48942 National Academy of Engineering Project: Exploring Content Standards for Engineering Education in K-12, PIN: NAEX-P-08-01-A. The goal of this exploratory project is to assess the potential value and feasibility of developing and implementing content standards for engineering education in K-12. The report is expected to be issued by 3-31-10.

DELMIA Education and Training Forum. http://www.delmia.com Learning opportunities for all ages in the latest 3D and PLM technology; from the early discovery of 3D at kindergarten and middle schools through a more sophisticated PLM knowledge at high-schools and universities.

Design and Discovery. http://www.intel.com/education/design An academic enrichment curriculum from Intel that engages students in hands-on engineering and design activities that enhance knowledge, and problem solving skill in the areas of science and engineering.

Design Based Learning. http://www.lrdc.pitt.edu/schunn/research/design.html University of Pittsburgh. Design-based learning (DBL) is a form of project-based learning in which students learn what they need to learn in a just-in-time fashion while trying to design something. In my group, we build 6-to-8-week-long DBL units for middle school and highschool math and science classrooms. These units use engineering design processes as a foundational structure for the units. Text of papers showing learning results.

Design Squad (PBS). http://pbskids.org/designsquad/projects/ From PBS program the design squad, projects to build toys, games, art, and other fun stuff. Low materials cost. Available in Spanish.

Educational Testing Service (ETS). http://texes.ets.org/. ETS offers preparation materials for the Texas certification tests.

Engineering is Elementary. http://www.mos.org/EiE/ Museum of Science (Boston, MA). The Engineering is Elementary (EiE) project aims to foster engineering and technological literacy among children. EiE is creating a research-based, standards-driven, and classroom-tested curriculum that integrates engineering and technology concepts and skills with elementary science topics. EiE lessons not only promote K-12 science, technology, engineering, and mathematics (STEM) learning, but also connect with literacy and social studies.

Engineering: Go For It. www.egfi-k12.org ASEE site with a variety of tools to boost your students' math and science skills, enliven the classroom with engineering projects, expand your own professional horizons and stay informed.

ETS Materials. http://texes.ets.org/prepMaterials/ A list of preparation manuals from ETS which you can download as pdf documents. You will want the manual for test number 174, Mathematics/Physical Science/Engineering 8-12.

Felder Homepage: Resources in Science and Engineering Education. http://www.ncsu.edu/felder-public/RMF.html Dr. Richard M. Felder is the Hoechst Celanese Professor Emeritus of Chemical Engineering at North Carolina State University. He has contributed over 200 publications to the fields of science and engineering education and chemical process engineering, and writes "Random Thoughts," a column on educational methods and issues for the quarterly journal Chemical Engineering Education. With his wife and colleague,

Dr. Rebecca Brent, he co-directs the National Effective Teaching Institute (NETI) and regularly offers teaching effectiveness workshops on campuses and at conferences around the world. His web site has a wealth of engineering education papers, many humorous, plus the Inventory of Learning Styles instrument.

FIRST Robotics Competition. http://www.usfirst.org US FIRST is a unique varsity sport of the mind designed to help high-school-aged young people discover how interesting and rewarding the life of engineers and researchers can be.

Ford Partnership for Advanced Studies. http://www.fordpas.org Provides high school students with high-quality interdisciplinary learning experiences that challenge them academically and develop their problem-solving, critical thinking, and communication skills. By building strong local partnerships with business and higher education, Ford PAS encourages and prepares students for success in college and professional careers in fields such as business, engineering, and technology.

Future Scientists and Engineers of America. http://www.fsea.org Discovery Science Center- National, Turn-key, Science & Engineering Program.

IEEE Real World Engineering Projects. http://www.realworldengineering.org/ A library of high-quality, tested, hands-on team-based society-focused projects for first-year students. These projects are designed to increase the recruitment, persistence to degree, and satisfaction of all students. Focused on freshmen engineering students, but adaptable.

IEEE Virtual Museum. http://www.ieeeghn.org The IEEE Global History Network is dedicated to preserving and promoting the history of innovation in the fields of electrical engineering, electronics and computing, and all their related fields.

Index of Learning Styles.
http://www4.ncsu.edu/unity/lockers/users/f/felder/public/ILSpage.html An on-line instrument used to assess preferences on four dimensions (active/reflective, sensing/intuitive, visual/verbal, and sequential/global) of a learning style model formulated by Richard M. Felder and Linda K. Silverman. The ILS may be used at no cost for non-commercial purposes by individuals who wish to determine their own learning style profile and by educators who wish to use it for teaching, advising, or research.

Infinity Project http://www.infinity-project.org A turn-key middle school, high school, and early college engineering curricula focusing on digital signal processing.

Intel Computer Clubhouse Network. http://www.computerclubhouse.org/index.htm
Provides a creative and safe after-school learning environment where young people from underserved communities work with adult mentors to explore their own ideas, develop skills, and build confidence in themselves through the use of technology.

International Technology Education Association. http://www.iteaconnect.org/index.html ITEA is a professional organization for technology, innovation, design, and engineering educators.

Junior Engineering Technical Society. http://www.jets.org JETS is a national non-profit educational organization dedicated to promoting engineering and technology careers to our nation's young people.

MESA Model. http://www.csuchico.edu/mesa/mesamodel.htm Engaging Underrepresented Students in Engineering.

The (NAE) Bridge: K-12 Engineering Education. http://www.nae.edu/TheBridge The Bridge is a quarterly publication of the National Academy of Engineering that presents thoughtful opinion and analysis on engineering research, education, and practice; science and technology policy; and the roles of engineering and technology in all aspects of society. The Fall 2009 issue (Volume: 39, Number: 3) was on K-12 Engineering Education. Available in pdf form at the site.

National Action Council for Minorities in Engineering. http://guidemenacme.org/guideme

National Engineers Week: Discover "E". http://www.eweek.org/site/DiscoverE/activities/ An opportunity for students and teachers to gain hands-on math and science experiences by working with someone who uses those subjects every day.

The National Science Foundation http://www.nsf.gov/news/classroom/engineering.jsp NSF collection of lessons and web resources.

National Society of Black Engineers. http://www.nsbe.org/precollege/index.html

OWL-Space, Rice U. https://owlspace-ccm.rice.edu/portal OWL-Space is Rice University's course and collaboration web tool. The REDE Community collaboration site provides resources and communication tools for the high school teachers participating in the Rice Engineering Design Experience, and others interested in the program.

PCS Edventures. http://www.edventures.com From hands-on learning labs in technology-rich subjects like engineering, science, math, robotics, IT, and electronics, to administrative tools designed to help schools manage the enormous amounts of data required in day-to-day school administration.

Pre K-12 Engineering. http://www.prek-12engineering.org Free resource for educators and administrators who are looking to integrate engineering concepts and activities into pre-k through twelfth grade classrooms. The activities available on the site are linked to the new Massachusetts Science and Technology/Engineering Curriculum Frameworks.

Project Lead the Way. http://www.pltw.org High school and middle school sequence of courses which introduces students to the scope, rigor and discipline of engineering and engineering technology prior to entering college.

PTC Design & Technology in Schools Program. http://www.ptc.com/for/education/schools/index.htm Provides teachers and professors with complete learning solutions.

Society of Automotive Engineers (SAE). http://students.sae.org Scholarships, loans, events, etc.

Society of Hispanic Professional Engineers (SHPE). http://www.shpe.org

Society of Women Engineers (SWE). http://www.swe.org

Southeast Regional T-STEM Center. http://www.utmb.edu/tstem/ Supports and provides resources for STEM course development.

State Board for Educator Certification (SBEC) http://www.sbec.state.tx.us/SBECOnline/certinfo/routescertif.asp#rtcert. Information about earning Texas teacher certification and/or adding certification fields.

TeachEngineering digital library. http://www.teachengineering.com Free resources for K-12 Math, Science and Engineering Teaching.

Technology Student Association (TSA). http://www.tsaweb.org Leadership and opportunities in technology, innovation, design and engineering. Members apply STEM (science, technology, engineering and mathematics) concepts through co-curricular programs.

TEKS: Career and Technology. http://ritter.tea.state.tx.us/teks/cteTEKS.html#C1 The draft Career and Technology TEKS and the Engineering courses are included in Subchapter O, the STEM cluster. If approved as expected, these courses will be offered beginning in the 2010-11 school year.

TEKS: High School Engineering-Technology. http://ritter.tea.state.tx.us/rules/tac/chapter123/index.html. The Texas Essential Knowledge and Skills (TEKS) for high school students in engineering classes can be found in Title 19, Part II, Chapter 123 of the Texas Administrative Code. In that chapter, the TEKS specific to engineering courses are: Chapter 123.33, Engineering Principles for one credit at http://ritter.tea.state.tx.us/rules/tac/chapter123/ch123c.html#123.33, and Chapter 123.63, Engineering Graphics for one-half to one credit at http://ritter.tea.state.tx.us/rules/tac/chapter123/ch123e.html#123.63. There are other related courses, so it is worth exploring several of the options in Chapter 123.

TEKS: High School Science. http://ritter.tea.state.tx.us/rules/tac/chapter112/ch112c.html Adopted to be effective August 4, 2009; Beginning in school year 2110-2011. Engineering Design is not included.

TEKS: High School Science, Proposed. http://ritter.tea.state.tx.us/teks/Sci_TEKS_9-12_Clean_010509.pdf January 5, 2009 – Proposed Recommendations for the Science TEKS, Grades 9-12; includes Engineering Design & Problem Solving, pp. 51-54

TX Teacher Certification in Engineering
www.sbec.state.tx.us/SBECOnline/standtest/standards/8-12engin.pdf The standards for teacher certification in Engineering can be downloaded as a pdf file.

TX Teacher certification test (TExES).
www.sbec.state.tx.us/SBECOnline/standtest/standards/8-12engin.pdf . The standards for the teacher certification test, TExES number 174, Mathematics/Physical Science/Engineering 8-12, pdf file.

UTeach Engineering (UT Austin). http://uteach.engr.utexas.edu/index.htm
UTeachEngineering is a collaborative initiative of the Cockrell School of Engineering and UTeach Natural Sciences at The University of Texas at Austin. Dedicated to creating leaders in the emerging field of secondary engineering education. Pre-service teacher training and certification.

West Point Bridge Design Contest. http://bridgecontest.usma.edu/ Download the West Point Bridge Designer software and design and test a virtual bridge. Submit your design to the contest and win scholarships.

Women in Engineering Proactive Network. http://www.wepan.org/ WEPAN