Elementary Classroom Engineering Kit

Engineering – applying math and science knowledge to solve problems – is an important part of the new statewide science standards adopted in September 2013. Even though new curriculum materials to support these standards won't be officially adopted for a couple more years, teachers can begin bringing some exciting engineering design challenge activities into their classrooms now using simple, everyday materials to explore creative solutions.

Children are natural engineers – they often start building and solving problems before they start school. Engineering projects tap into things they enjoy doing and can feel like play, while simultaneously teaching important concepts. Engineering is also interdisciplinary and can be a valuable tool to connect Common Core math and English language arts standards with science learning.

The jobs of the future will require skills in critical thinking, communication, and problem solving. Classroom engineering challenges are a great way to develop and practice these skills!

The following supplies would stock a classroom kit, allowing a teacher to do multiple engineering activities with a class of 25-30 students. Possible activities include: building boats, bridges, and other structures; making catapults; egg drop challenges; parachute testing and many others. As a package, it would make a great wish list item for DonorsChoose.org or similar teacher classroom grant opportunities!

- 1 box gallon sized zip lock bags (to make kits for students)
- 10 packs - index cards 3x5 (card towers, bridges)
- 10 rolls of masking tape
- 3 boxes of unwrapped straws
- 36 Large washers (and/or sand and/or pennies) (to use as weights)
- 2 boxes (~400) small (2-3oz) paper or plastic cups (parachutes, structures)
- 2 rolls aluminum foil
- 4 rolls of twine
- 1 box (1000ct) 4-1/2" x 3/8" Craft sticks
- 1 box (500ct) 6" tongue depressors
- 1 box (1000ct) 5-1/2" stirring sticks
- 1 container (~500ct) rubber bands, various sizes
- 4 yards felt
- 4 yards cotton, other light cloth material (parachutes)
- 1 box (60+) plastic garbage bags, tall kitchen
- 4 boxes (~400) jumbo or large paper clips
- 4 lbs (64 oz) plasticine - ~2 oz / student (to make boats - buoyancy)
- 4 bags cotton balls
- 2 boxes (~96) plastic spoons
- 2 bags (~200) 12" pipe cleaners
- 3 boxes filter paper, various sizes – larger is best (parachutes)
- 4 packs (~400 sheets) 20" x 26" tissue paper (parachutes)
- Rulers (1/student)
- Glue sticks (1/student)
- 1 Table / box fan (to test structures resistance to wind)
- 6 (1/group) plastic shoebox-sized boxes (should hold water)
- 16 ping-pong balls (some will get lost)

Materials students can bring from home:

Clean styrofoam plates, trays, plastic strawberry containers, other small plastic containers, old CDs, twist on plastic bottle caps (from soda and water bottles), pieces of cardboard (ideally at least 12" x 12"), cardboard tubes, TP tubes, paper towel tubes.

Links to engineering lessons:

Catapults:
http://www.teachengineering.org/view_lesson.php?url=collection/cub_/lessons/cub_catapult/cub_catapult_lesson01.xml

Parachutes:
http://www.tryengineering.org/lesson-plans/playing-parachutes

Plasticine boat:
http://www.teachengineering.org/view_activity.php?url=collection/duk_/activities/duk_float_mary_act/duk_float_mary_act.xml
http://www.wonderville.ca/asset/float-like-a-boat

Bridge building:
https://www.exploratorium.edu/science_explorer/card_bridge.html

Structure, strength testing:
http://www.centexeweek.org/activities/card-structure

General structural challenges (seems to be interesting resource, maybe for website?):
http://www.asceville.org/activity-structural-challenges.html

Egg drop:
http://www.nasa.gov/offices/education/programs/national/summer/education_resources/engineering_grades7-9/E_egg-drop.html
http://www.stem.neu.edu/programs/k-12-school-field-trips/egg-drop/
http://teachers.egfi-k12.org/lesson-egg-drop/