

Grade 8 Design Challenge Quick Guide: Solving a Real World Problem – Cycle 1

Lesson Objective(s): Students will balance several chemical equations and solve a real world problem.

Materials:

For teams of 2-3 students

- Design logs
- “Jelly Bean Equations” handout with Grid
- “Combustion in Brief” handout
- “Balanced Equations Quicknotes” handout
- “Chemical Equations Algebra” handout
- “Pipeline Explosion Article” handout
- “Sandwich Bag Explosions” handout
- “Washington Parish Blast” handout
- 21st Century Skill rubric to grade student project
- Jelly beans for modeling (see “Jelly Bean Equations” handout for more info.)
- Toothpicks
- Poster board
- Markers
- Index cards
- Self-chosen materials for the redesign task

Websites

- <http://www.bing.com/videos/search?q=natural+gas+explosion&FORM=HDRSC3>
- <http://www.quirkyscience.com/chemical-explosions/>
- <https://www.khanacademy.org/science/chemistry/chemical-reactions-stoichiometry/v/balancing-chemical-equations>
- http://www.nola.com/traffic/index.ssf/2013/06/gasline_explosion_reported_in.html
- <http://www.wisegeek.org/what-does-it-mean-to-be-a-canary-in-a-coal-mine.htm>

TEKS:

Science

 SCI 8.3C Identify the advantages and limitations of models such as size, scale, properties, and materials.

* SCI 8.5D Recognize that chemical formulas are used to identify substances and determine the number of atoms of each element in chemical formulas containing subscripts.

 SCI 8.5F Recognize whether a chemical equation containing coefficients is balanced or not and how that relates to the law of conservation of mass.

Math

 MA 8.1A Apply mathematics to problems arising in everyday life, society, and the workplace.

MATH.8.5E Solve problems involving direct variation.

ELPS	CCRS Science	CCRS Math	CCRS Cross-disciplinary
C1D, C2D	5E1A, 7G2A	2D1B, 8C1B	1E2C, 2C3A

Engineering Design Loop: *For more details, refer to the overview page.*

Identify the Need: Teams of students will be challenged to find chemical equations for the combustion of fuels.

Research the Problem Teams will conduct research on combustion, natural gas, explosions, and chemical reactions.

Develop Possible Solutions: Teams will use jelly beans and toothpicks to model chemical equations.

Select the Most Promising Solution: Teams will use their research and jelly bean modeling skills to create their balanced chemical equations assigned to them from the federal inspectors of the Washington Parish pipeline explosion.

Construct a Prototype: Teams will assemble models of their equations and create a poster of the reactions.

Test & Evaluate: Teams will write an essay to explain the steps they took to solve the problem and justify their choices.

Communicate their Design: Teams will communicate their design by sending their final conclusions and chemical equations to the federal inspectors via a post card (index card).

Redesign: Teams will use their own creativity to design additional models to balance chemical equations.

Math Connection: Students will be challenged to balance large chemical equations using an algebraic method.