ENGINEERING DESIGN
Engineering Design
Faith supporting Reason • Recognize our talents and share them with one another in order to do God's will • All people are created with minds and the gift of reason • How we approach living out the scripture is similar to how we approach design problems- through reflection and meditation to reach the desired outcome • Consider the potential effects of a solution on humans and the environment within the moral framework of the church
Catholics making contribution to the topic • Jules Henri Poincare (1854-1912)- engineer • William of Ockham (c.1288–c.1348) – Franciscan Friar known for Ockham's Razor • Pope Francis (1936-present) Chemical engineer • Johannes Gutenberg (1398-1468) Inventor of the printing press
Science outcomes 1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. (MS-ETS1-1) 2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. (MS-ETS1-2) 3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success. (MS-ETS1-3) 4. Develop a model to generate data for repetitive testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. (MS-ETS1-4)
Engineering - Experiments - Extension Activities • Field Trip: KU Engineering Expo and website for competition activities • Field Trip: Wildwood- team building that solves design problems • Build a stained glass window depicting various biblical scenes
Crosscutting Concepts • Religion-Modern scientific measurements of the Arc using conversions, engineer a sling shot that would replicate David's sling shot given Goliath's statistics. • ELA- Writing multi-step procedures, non-fiction reading to research the science principles behind engineering concepts • Math- Calculate mean, median and mode using testing data, ratio of weigh held to mass, geometry of triangles, angles, circles, graphic data • P.E.- team building activities that solve design problems given certain constraints (ropes course) • Social Studies- History of famous inventions (catapults, Trojan horse, railroad)
Resources: • Books: Introducing Engineering to K-12 Students by ASME, Engineering Your Future by Great Lakes Press • Apps: Roller Coaster Design, Ratventure, Monorail • Websites: http://groups.ku.edu/~kuesc/expo/activities/competitions, http://www.pbs.org/wgbh/buildingbig/bridge/, sciencepioneers.org

- Bible verses: Inquiry and Reasoning Is 1:18, Heb 11:1-3, Pro 1: 7
- Video: http://www.pbs.org/wgbh/buildingbig/bridge/,
  http://www.engineering.com/Videos/tabid/4624/Default.aspx
- Catholic Scientists http://en.wikipedia.org/wiki/List_of_Catholic_scientists
  http://en.wikipedia.org/wiki/List_of_Roman_Catholic_cleric%E2%80%93scientists

Key content vocabulary: Scientific method, inquiry, design problem, hypothesis, controls, independent and dependent variables, systematic process, observation, analysis, evidence, validity, reliability, metric system, communicate results