

Hanover Township Public Schools
PACT - STEM Curriculum

(subject)

Grade: 6, 7, 8 Unit of Study: **Engineering and Real World Problem Solving**

<i>Unit of Study Essential Questions (Purpose of Unit of Study)</i>	<i>Key Learning Objectives</i>	<i>Student Accomplishments</i>	<i>Assessment (How student will demonstrate knowledge)</i>	<i>Resources and Sample Activities</i>	<i>Suggested Length of Study and Dates</i>
<p>What is engineering? What are technologies and innovations? How are problems solved through engineering? What is the engineering design process and how is it used to solve problems? How is biomimicry used to enhance engineering? What is reverse engineering and what entails systems engineering?</p>	<p>ELA- Literacy.RST.6 -8.1-10</p> <p>ELA- Literacy.RI.6/7 /8.1-4</p> <p>ELA- Literacy.W.6/7/ 8.1,2,4,7,8,9B, 10</p> <p>ELA- Literacy.SL.6/7 /8.1-6</p> <p>Math.Content.6 /7.RP.A.3.C</p> <p>Math.Content.6 .EEC.9</p> <p>Math.Content.6 .SP.B.5</p> <p>Math.Content.7 .NS.A.1,2,3</p> <p>Math.Content.7 .G.A.1</p>	<p>SWBAT:</p> <ul style="list-style-type: none"> - define engineering, technology, and innovations - explain various careers in engineering - understand and apply the engineering design process in investigations - understand and apply the concepts of criteria and constraints in engineering design - design and build innovations to solve various problems, both imaginary and realistic - understand and apply principles of biomimicry in design - explain and apply reverse engineering - create a systems diagram and assembly manual for a common product - follow directions and diagrams to reassemble a common product - collect, organize, and analyze data - investigate the effects of a covering on the solar heating of a model house 	<ul style="list-style-type: none"> - Design Process worksheets - “On the Job” chart - Design descriptions, diagrams, and prototypes - Exploring Biomimicry worksheet - Data reports and evaluations - technology brainstorming worksheet - solar house designs, data, analyses, and evaluations - research reports - golf ball data, analysis, and evaluations - sporting equipment timeline - design, description, and scientific justification of improved sports equipment - Innovation Hunt - “Making a Difference in My Community” report, design, and prototype 	<ul style="list-style-type: none"> - www.eie.org - Mystery Box Design Challenges - www.teachengineering.org - “Design Inspired by Nature” - www.egfi-k12.org - The Engineering Design Process - “On Target” - students design device to drop a marble on a target; connect to NASA innovations - Engineering job descriptions and videos - Super Slinger Challenge - “It’s Getting Hot in Here” - 3M solar energy investigation - Reverse Engineer a Camera (disposable) - disassemble, create diagrams and assembly manual, reassemble camera using another group’s instructions - “The Everyday Science of Sports” - 3M investigation into 	<p>approx. 6 weeks</p>

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		<ul style="list-style-type: none"> - conduct an energy audit of their home and analyze the results - apply concepts of aerodynamics, drag, air friction, and bounce to golf ball design - understand how physics and engineering impact safety and performance of designs, including sports equipment - conduct research on past and current innovations - design an innovation to solve a problem that impacts individuals in the community - work cooperatively in groups 		<p>physics behind golf ball design; students design improvements to other sports equipment</p> <p>- “Make it All Better” - students identify real problems in our community and design innovations to solve them</p>	

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The following activities and experiences for students are examples of the integration of specific skills and strategies which support student achievement for the unit.

Interdisciplinary Connections:	Science - scientific process, physics, conducting experiments Art - design of innovations LAL - reading informational texts, writing assembly manual, conducting research, writing design process reports and research reports Math - data reports and analysis
Integration of Technology:	use various materials to build prototypes use reliable online resources to conduct research use computers to type research findings
Differentiated Instruction:	many solutions accepted to solve design challenges choice in design materials choice in sports equipment to improve in “The Everyday Science of Sports” choice in community problem to solve in “Make It All Better”

21st Century Themes

Global Awareness	Financial, Economic, Business, and Entrepreneurial Literacy	Civic Literacy	Health Literacy
using the engineering design process to solve real-world problems	entrepreneurial skills to develop engineering solutions	Applying engineering principles to improve the community	applying engineering principles to design safer sports equipment

21st Century Skills

Creativity and Innovation	Critical Thinking and Problem Solving	Communication and Collaboration	Information Literacy
thinking creatively, working creatively with others, implementing innovations	reasoning effectively, using systems thinking, making judgements and decisions, solving problems	working in collaborative groups, sharing findings with class, discussions	evaluating and applying information to solve problems
Media Literacy	ICT Literacy	Life and Career Skills	
read and watch various media to conduct research	conduct research using reliable online resources	Engineering Careers, working cooperatively, managing goals and time during engineering challenges, approach projects on a professional level, produce high quality products	