MINUTEMAN ENGINEERING EDUCATION OUTREACH PROGRAM

Contact Information:

George Taliadouros
Minuteman Regional High School
758 Marrett Road
Lexington, MA
Telephone: 781-861-6500

The Department's Educational Philosophy

The Minuteman Outreach Program is designed not only to create a bridge within Minuteman's regional district and the schools within it, but also to provide the surrounding communities with the teachers, tools and talent for enriching the minds of their students. The Minuteman Regional High School and the town's middle schools share the responsibility not only to provide a balanced curriculum but also to expose the students to the many options that are available to them. With this in mind, the Minuteman Outreach Program provides the towns with an Engineering Education Program that will prepare students for the Technology portion of the Science & Technology MCAS, as well utilize the resources the Minuteman High School has for Technology and Engineering.

Guiding Principles

A school can serve families and students best if the families endorse the philosophic foundation on which the school operates. To allow you to judge that foundation, here are the main points of the philosophy that guides Minuteman operations.

1. Most students, up to 60%, learn best from experiencing, rather than just hearing or reading about knowledge and procedures. Minuteman emphasizes laboratory-based and project-based learning of academic skills.
2. Each student has a unique set of learning styles and talents. The Minuteman Outreach Program helps each student identify and use his or her special strengths.
3. Motivation is critical to success in learning and life. The Minuteman Outreach Program uses a lab-based, hands-on approach to make the lessons "tangible" and "concrete," so that a better level of understanding can be attained.
4. Students learn best in a supportive rather than a coercive environment. So, while maintaining a safe environment, teachers emphasize cause and effect while stressing the Engineering – Design Process.
5. The school environment must be both safe and challenging. We invite parents and other interested parties to visit and take pride in that environment in the Outreach Program's classroom.
6. Our quality of life and the strength of our nation depend upon honesty, graciousness, and respect and helpfulness directed toward others. The Minuteman Outreach Program expects these qualities from its students.

Minuteman Engineering Education Outreach Program

Course Frequency: 8th Grade: 36 classes / 1/5 school year / 1 "quint"
7th Grade: 45 classes / 1/4 school year / 1 semester (every-other day class alternates)

Credits Offered: N/A (Pass/Fail class)

Prerequisites: N/A

Background to the Curriculum

1. How was this course curriculum developed?

   The Minuteman Engineering Outreach Program was developed completely by the teachers that run it. Each school has a different curriculum and set of lessons, but all are designed to achieve the benchmarks that the Dept. of Education set before 8th graders matriculate to High School. The Minuteman High School teachers placed at R. J. Grey Junior High School developed all of the lessons encapsulated in this document. The current curriculum has been used over the past three years. The lessons have been upgraded and made more efficient and involved by using a range of resources provided both by Minuteman High School and by the Acton-Boxborough Regional School District. The current instructors at R. J. Grey Junior High School – Brian Crossman for 7th grade and Mark Rodriquenz for 8th grade – researched, developed and in some cases even marketed the current Minuteman Engineering Outreach Curriculum.

2. What is the relationship of this curriculum to national and state standards?

   The Minuteman Engineering Outreach Program's Curriculum is designed not only to enrich the minds of the students, create connections with Minuteman High School, and break down the stereotypes associated with Engineering but also to meet all the needs of the Acton-Boxborough School System and its responsibility to the Massachusetts Dept. of Education's Engineering Education Frameworks.

   In the 2000-2001 school year, the Minuteman Engineering Outreach Program operated on a limited curriculum while the state's standards were being re-tooled and introduced to school systems. Over the past five years the instructors at the Acton-Boxborough Regional School District's Minuteman Outreach Program have developed a series of lessons that teach the concepts outlined in the current D.O.E. Frameworks.

   New concepts and technologies are constantly being introduced and/or expanded upon within the Frameworks, and the Minuteman Curriculum is utilizing many forms of professional development, conferences, and lesson-sharing within and outside of the other Minuteman Outreach Programs.

3. Where should a person go for more information?

   If more information regarding the Minuteman Outreach Program is needed, one could contact Minuteman Regional High School or visit its webpage: http://www.minuteman.org

   To view the current Engineering Education Frameworks, one could visit the Dept. of Education's website: http://www.doe.mass.edu/frameworks/current.html

Core Topics/Questions/Concepts/Skills

Course-End Learning Objectives

Learning objectives (separated by activity and/or lesson)	**Corresponding state standards, *where applicable***
7th GRADE	
Rocketry (Water Rockets) ***By the end of this activity, students will:*** 1] Understand the concept of "trade offs" in the Engineering / Design Process. 2] Use critical thinking skills; identify and solve basic engineering problems. 3] Understand and apply the design process (Problem Identification, Preliminary Ideas, Prototype Construction, Analysis, Refinement, Final Product). 4] Combine math, science and technology concepts to solve concrete problems. 5] Develop an intuitive sense of the physical world around them. 6] Understand and thrive on a cooperative learning environment. 7] Obtain positive and satisfactory results through the trial and error process.	**Materials and Tools** 1.1 Given a design task, identify appropriate materials (e.g., wood, paper, plastic, aggregates, ceramics, metals, solvents, adhesives) based on specific properties and characteristics (e.g., strength, hardness, and flexibility). 1.2 Identify and explain appropriate measuring tools, hand tools, and power tools used to hold, lift, carry, fasten, and separate and explain their safe and proper use. **Engineering Design** 2.1 Identify and explain the steps of the engineering design process; i.e., identify the need or problem, research the problem, develop possible solutions, select the best possible solution(s), construct a prototype, test and evaluate, communicate the solution(s), and redesign.

8] Accurately and safely manipulate all necessary hand tools and machines that they may come into contact with in the Engineering Shop.	2.2 Demonstrate methods of representing solutions to a design problem; e.g., sketches, orthographic projections, multiview drawings. 2.3 Describe and explain the purpose of a given prototype. 2.4 Identify appropriate materials, tools, and machines needed to construct a prototype of a given engineering design. 2.5 Explain how such design features as size, shape, weight, function, and cost limitations would affect the construction of a given prototype. 2.6 Identify the five elements of a universal systems model: goal, inputs, processes, outputs, and feedback.
<u>Electric Dragster</u> ***By the end of this activity, students will:*** 1] Have a broader understanding of the Engineering Design Process. 2] Develop competencies in basic electronics. 3] Be exposed to wire stripping techniques and simple soldering. 4] Research the internet for ideas and procedures. 5] Understand basic electronic circuits. 6] Practice the safe use of tools and machines. 7] Become familiar with modes of transportation.	**<u>Materials, Tools, and Machines</u>** Broad Concept: Appropriate materials, tools, and machines enable us to solve problems, invent, and construct. 1.1 Given a design task, identify appropriate materials (e.g., wood, paper, plastic, aggregates, ceramics, metals, solvents, adhesives) based on specific properties and characteristics (e.g., weight, strength, hardness, and flexibility). 1.2 Identify and explain appropriate measuring tools, hand tools, and power tools used to hold, lift, carry, fasten, and separate, and explain their safe and proper use. 1.3 Identify and explain the safe and proper use of measuring tools, hand tools, and machines (e.g., band saw, drill press, sanders, hammer, screwdriver, pliers, tape measure, screws, nails, and other mechanical fasteners) needed to construct a prototype of an engineering design.

	Engineering Design Broad Concept: Engineering design is an interactive process involving modeling and optimizing for developing technological solutions to problems within given constraints. 2.1 Identify and explain the steps of the engineering design process; i.e., identify the need or problem, research the problem, develop possible solutions, select the best possible solution(s), construct a prototype, test and evaluate, communicate the solution(s), and redesign. 2.2 Demonstrate methods of representing solutions to a design problem; e.g., sketches, orthographic projections, multiview drawings. 2.3 Describe and explain the purpose of a given prototype. 2.4 Identify appropriate materials, tools, and machines needed to construct a prototype of a given engineering design. 2.5 Explain how such design features as size, shape, weight, function, and cost limitations would affect the construction of a given prototype. 2.6 Identify the five elements of a universal systems model: goal, inputs, processes, outputs, and feedback. **Manufacturing Technologies** 4.4 Explain basic processes in manufacturing systems; e.g., cutting, shaping, assembling, joining, finishing, quality control, and safety. **Transportation Technologies** 6.1 Identify and compare examples of transportation systems and devices that operate on or in each of the following: land, air, water, and space.

<u>Boat Hull Design Challenge</u> ***By the end of this activity, students will:*** 1] Demonstrate how to select the appropriate materials when given a design task, based on specific properties and characteristics. 2] Practice the safe use of measuring and hand and power tools. 3] Apply the steps of the Engineering Design Process. 4] Present solutions to a design problem using sketches, orthographic, or multiview drawings. 5] Apply the five elements of the universal systems model: goal, inputs, process, output and feedback. 6] Identify and compare examples of water transportation systems. 7] Identify and describe subsystems of a water vehicle. 8] Identify and explain drag and friction in a water vehicle. 9] Define transportation as a system.	6.2 Given a transportation problem, explain a possible solution using the universal systems model. 6.3 Identify and describe three subsystems of a transportation vehicle or device; i.e., structural, propulsion, guidance, suspension, control, and support. 6.4 Identify and explain lift, drag, friction, thrust, and gravity in a vehicle or device; e.g., cars, boats, airplanes, rockets. **<u>Materials, Tools, and Machines</u>** Broad Concept: Appropriate materials, tools, and machines enable us to solve problems, invent, and construct. 1.1 Given a design task, identify appropriate materials (e.g., wood, paper, plastic, aggregates, ceramics, metals, solvents, adhesives) based on specific properties and characteristics (e.g., weight, strength, hardness, and flexibility). 1.2 Identify and explain appropriate measuring tools, hand tools, and power tools used to hold, lift, carry, fasten, and separate, and explain their safe and proper use. 1.3 Identify and explain the safe and proper use of measuring tools, hand tools, and machines (e.g., band saw, drill press, sanders, hammer, screwdriver, pliers, tape measure, screws, nails, and other mechanical fasteners) needed to construct a prototype of an engineering design. **<u>Engineering Design</u>** Broad Concept: Engineering design is an interactive process involving modeling and optimizing for developing technological solutions to problems within given constraints.

	2.1 Identify and explain the steps of the engineering design process; i.e., identify the need or problem, research the problem, develop possible solutions, select the best possible solution(s), construct a prototype, test and evaluate, communicate the solution(s), and redesign. 2.2 Demonstrate methods of representing solutions to a design problem; e.g., sketches, orthographic projections, multiview drawings. 2.3 Describe and explain the purpose of a given prototype. 2.4 Identify appropriate materials, tools, and machines needed to construct a prototype of a given engineering design. 2.5 Explain how such design features as size, shape, weight, function, and cost limitations would affect the construction of a given prototype. 2.6 Identify the five elements of a universal systems model: goal, inputs, processes, outputs, and feedback. **<u>Transportation Technologies</u>** 6.1 Identify and compare examples of transportation systems and devices that operate on or in each of the following: land, air, water, and space. 6.2 Given a transportation problem, explain a possible solution using the universal systems model. 6.3 Identify and describe three subsystems of a transportation vehicle or device; i.e., structural, propulsion, guidance, suspension, control, and support. 6.4 Identify and explain lift, drag, friction, thrust, and gravity in a vehicle or device; e.g., cars, boats, airplanes, rockets.

Wind Sail Car Design Challenge	Materials, Tools, and Machines
Upon completion of this activity, students should be able to: 1] List related careers. 2] Understand the topics of friction and the physics behind it. 3] Understand the theory of aerodynamics. 4] Use basic woodworking tools safely and correctly. 5] Use wind as a propulsion system. 6] Measure to 1/16”. 7] Design a wind-powered vehicle. 8] Understand the effects of lubrication. 9] Solve problems with critical thinking. 10] Test and evaluate a wind-powered vehicle.	Broad Concept: Appropriate materials, tools, and machines enable us to solve problems, invent, and construct. 1.1 Given a design task, identify appropriate materials (e.g., wood, paper, plastic, aggregates, ceramics, metals, solvents, adhesives) based on specific properties and characteristics (e.g., weight, strength, hardness, and flexibility). 1.2 Identify and explain appropriate measuring tools, hand tools, and power tools used to hold, lift, carry, fasten, and separate, and explain their safe and proper use. 1.3 Identify and explain the safe and proper use of measuring tools, hand tools, and machines (e.g., band saw, drill press, sanders, hammer, screwdriver, pliers, tape measure, screws, nails, and other mechanical fasteners) needed to construct a prototype of an engineering design. **Engineering Design** Broad Concept: Engineering design is an interactive process involving modeling and optimizing for developing technological solutions to problems within given constraints. 2.1 Identify and explain the steps of the engineering design process; i.e., identify the need or problem, research the problem, develop possible solutions, select the best possible solution(s), construct a prototype, test and evaluate, communicate the solution(s), and redesign. 2.2 Demonstrate methods of representing solutions to a design problem; e.g., sketches, orthographic projections, multiview drawings. 2.3 Describe and explain the purpose of a given prototype.

CO2 Car Dragster Design Project

At the conclusion of this activity, the student should be able to:

1] Show proficient and safe use of hand tools and machines.
2] Understand the principles of CO2 propulsion.
3] Make calculations relating to MPH and velocity.
4] Identify the parts of a CO2 car.
5] Identify careers related to the transportation industry.
6] Understand the criteria of a well-designed vehicle.
7] Identify and solve problems and think critically.

2.4 Identify appropriate materials, tools, and machines needed to construct a prototype of a given engineering design.

2.5 Explain how such design features as size, shape, weight, function, and cost limitations would affect the construction of a given prototype.

2.6 Identify the five elements of a universal systems model: goal, inputs, processes, outputs, and feedback.

Transportation Technologies

6.1 Identify and compare examples of transportation systems and devices that operate on or in each of the following: land, air, water, and space.

6.2 Given a transportation problem, explain a possible solution using the universal systems model.

6.3 Identify and describe three subsystems of a transportation vehicle or device; i.e., structural, propulsion, guidance, suspension, control, and support.

6.4 Identify and explain lift, drag, friction, thrust, and gravity in a vehicle or device; e.g., cars, boats, airplanes, rockets.

Materials, Tools, and Machines

Broad Concept: Appropriate materials, tools, and machines enable us to solve problems, invent, and construct.

1.1 Given a design task, identify appropriate materials (e.g., wood, paper, plastic, aggregates, ceramics, metals, solvents, adhesives) based on specific properties and characteristics (e.g., weight, strength, hardness, and flexibility).

8] Draw thumbnail and rough sketches. 9] Identify types of finishes and finishing techniques.	1.2 Identify and explain appropriate measuring tools, hand tools, and power tools used to hold, lift, carry, fasten, and separate, and explain their safe and proper use. 1.3 Identify and explain the safe and proper use of measuring tools, hand tools, and machines (e.g., band saw, drill press, sanders, hammer, screwdriver, pliers, tape measure, screws, nails, and other mechanical fasteners) needed to construct a prototype of an engineering design. **<u>Engineering Design</u>** Broad Concept: Engineering design is an interactive process involving modeling and optimizing for developing technological solutions to problems within given constraints. 2.1 Identify and explain the steps of the engineering design process, i.e., identify the need or problem, research the problem, develop possible solutions, select the best possible solution(s), construct a prototype, test and evaluate, communicate the solution(s), and redesign. 2.2 Demonstrate methods of representing solutions to a design problem; e.g., sketches, orthographic projections, multiview drawings. 2.3 Describe and explain the purpose of a given prototype. 2.4 Identify appropriate materials, tools, and machines needed to construct a prototype of a given engineering design. 2.5 Explain how such design features as size, shape, weight, function, and cost limitations would affect the construction of a given prototype. 2.6 Identify the five elements of a universal systems model: goal, inputs, processes, outputs, and feedback.

	Transportation Technologies 6.1 Identify and compare examples of transportation systems and devices that operate on or in each of the following: land, air, water, and space. 6.2 Given a transportation problem, explain a possible solution using the universal systems model. 6.3 Identify and describe three subsystems of a transportation vehicle or device; i.e., structural, propulsion, guidance, suspension, control, and support. 6.4 Identify and explain lift, drag, friction, thrust, and gravity in a vehicle or device; e.g., cars, boats, airplanes, rockets.

8th GRADE

Vehicle Impact Testing

By the end of this activity, students will:

1] Understand the concepts behind the design, construction, and engineering that go into the production of an automobile and the safety systems incorporated into the vehicle.

2] Understand the basic physics behind impact.

3] Use critical thinking skills; identify and solve basic engineering problems.

4] Understand and apply the design process (problem identification, preliminary ideas, prototype construction, prototype analysis, prototype refinement, final product).

5] Combine math, science and technology concepts to solve concrete problems.

6] Develop an intuitive sense of the physical world around them.

7] Understand and thrive in a cooperative learning environment.

8] Through the trial and error process, obtain positive and satisfactory results.

9] Accurately and safely manipulate all necessary hand tools and machines that they may come into contact with in the Tech. Ed. Shop.

Materials, Tools, and Machines

Broad Concept: Appropriate materials, tools, and machines enable us to solve problems, invent, and construct.

1.1 Given a design task, identify appropriate materials (e.g., wood, paper, plastic, aggregates, ceramics, metals, solvents, adhesives) based on specific properties and characteristics (e.g., weight, strength, hardness, and flexibility).

1.2 Identify and explain appropriate measuring tools, hand tools, and power tools used to hold, lift, carry, fasten, and separate, and explain their safe and proper use.

1.3 Identify and explain the safe and proper use of measuring tools, hand tools, and machines (e.g., band saw, drill press, sanders, hammer, screwdriver, pliers, tape measure, screws, nails, and other mechanical fasteners) needed to construct a prototype of an engineering design.

Engineering Design

Broad Concept: Engineering design is an interactive process involving modeling and optimizing for developing technological solutions to problems within given constraints.

2.1 Identify and explain the steps of the engineering design process; i.e., identify the need or problem, research the problem, develop possible solutions, select the best possible solution(s), construct a prototype, test and evaluate, communicate the solution(s), and redesign.

2.2 Demonstrate methods of representing solutions to a design problem; e.g., sketches, orthographic projections, multiview drawings.

<u>Balsa Wood Bridge Designing/Construction</u> ***By the end of this activity, students will:*** 1] Understand the concepts behind the design, construction, and physics used in the different types of bridges in our society. 2] Understand the use of "trade-offs" in the design and engineering process. 3] Use critical thinking skills; identify and solve basic engineering problems. 4] Understand and apply the design process (problem identification, preliminary ideas, prototype construction, prototype analysis, prototype refinement, final product).	2.3 Describe and explain the purpose of a given prototype. 2.4 Identify appropriate materials, tools, and machines needed to construct a prototype of a given engineering design. 2.5 Explain how such design features as size, shape, weight, function, and cost limitations would affect the construction of a given prototype. 2.6 Identify the five elements of a universal systems model: goal, inputs, processes, outputs, and feedback. **<u>Communication Technologies</u>** Central Concept: Ideas can be communicated through engineering drawings, written reports, and pictures. 3.3 Identify and compare communication technologies and systems; i.e., audio, visual, printed, and mass communication. 3.4 Identify and explain how symbols and icons (e.g., international symbols and graphics) are used to communicate a message **<u>Materials, Tools, and Machines</u>** Broad Concept: Appropriate materials, tools, and machines enable us to solve problems, invent, and construct. 1.1 Given a design task, identify appropriate materials (e.g., wood, paper, plastic, aggregates, ceramics, metals, solvents, adhesives) based on specific properties and characteristics (e.g., weight, strength, hardness, and flexibility). 1.2 Identify and explain appropriate measuring tools, hand tools, and power tools used to hold, lift, carry, fasten, and separate, and explain their safe and proper use.

5] Combine math, science and technology concepts to solve concrete problems. 6] Develop an intuitive sense of the physical world around them. 7] Understand and thrive in a cooperative learning environment 8] Through the trial and error process, obtain positive and satisfactory results 9] Accurately and safely manipulate all necessary hand tools and machines that they may come into contact within the Tech. Ed. Shop.	1.3 Identify and explain the safe and proper use of measuring tools, hand tools, and machines (e.g., band saw, drill press, sanders, hammer, screwdriver, pliers, tape measure, screws, nails, and other mechanical fasteners) needed to construct a prototype of an engineering design. **<u>Engineering Design</u>** Broad Concept: Engineering design is an interactive process involving modeling and optimizing for developing technological solutions to problems within given constraints. 2.1 Identify and explain the steps of the engineering design process; i.e., identify the need or problem, research the problem, develop possible solutions, select the best possible solution(s), construct a prototype, test and evaluate, communicate the solution(s), and redesign. 2.2 Demonstrate methods of representing solutions to a design problem; e.g., sketches, orthographic projections, multiview drawings. 2.3 Describe and explain the purpose of a given prototype. 2.4 Identify appropriate materials, tools, and machines needed to construct a prototype of a given engineering design. 2.5 Explain how such design features as size, shape, weight, function, and cost limitations would affect the construction of a given prototype. 2.6 Identify the five elements of a universal systems model: goal, inputs, processes, outputs, and feedback. **<u>Construction Technologies</u>** Broad Concept: Construction technology involves building structures in order to contain, shelter, manufacture, transport, communicate, and provide recreation.

5.1 Describe and explain parts of a structure; e.g., foundation, flooring, decking, wall, roofing systems.

5.2 Identify and describe three major types of bridges (e.g., arch, beam, and suspension) and their appropriate uses (e.g., site, span, resources, and load).

5.3 Explain how the forces of tension, compression, torsion, bending, and shear affect the performance of bridges.

5.4 Describe and explain the effects of loads and structural shapes on bridges.

<u>Monster Truck Project</u>

During this activity, students will:

1] Practice the safe use of the tools.

2] Practice the Engineering Design process.

3] Experience the basic concepts of the planning, layout, and construction of a motor-driven 4-wheel drive vehicle with a spring-based suspension system.

4] Troubleshoot the vehicle and make changes where necessary.

5] List and explain the steps necessary in the designing, layout, and construction of a complete scaled model of a "Monster truck."

<u>Materials, Tools, and Machines</u>

Broad Concept: Appropriate materials, tools, and machines enable us to solve problems, invent, and construct.

1.1 Given a design task, identify appropriate materials (e.g., wood, paper, plastic, aggregates, ceramics, metals, solvents, adhesives) based on specific properties and characteristics (e.g., weight, strength, hardness, and flexibility).

1.2 Identify and explain appropriate measuring tools, hand tools, and power tools used to hold, lift, carry, fasten, and separate, and explain their safe and proper use.

1.3 Identify and explain the safe and proper use of measuring tools, hand tools, and machines (e.g., band saw, drill press, sanders, hammer, screwdriver, pliers, tape measure, screws, nails, and other mechanical fasteners) needed to construct a prototype of an engineering design.

	Engineering Design 2.1 Identify and explain the steps of the engineering design process; i.e., identify the need or problem, research the problem, develop possible solutions, select the best possible solution(s), construct a prototype, test and evaluate, communicate the solution(s), and explain. 2.3 Describe and explain the purpose of a given prototype. 2.4 Identify appropriate materials, tools, and machines needed to construct a prototype of a given engineering design. 2.5 Explain how such design features as size, shape, weight, function, and cost limitations would affect the construction of a given prototype. **Transportation Technologies** 6.1 Identify and compare examples of transportation systems and devices that operate on each of the following: land, air, water, and space. 6.2 Given a transportation problem, explain a possible solution using the universal systems model. 6.3 Identify and describe three subsystems of a transportation vehicle or device; i.e., structural, propulsion, guidance, suspension, control, and support.

Assessment

As of September of 2007, the Minuteman Engineering Lab course(s) are designated as one of Acton's "Exploratory" classes. By following the model associated with all the other Exploratory classes at RJ Grey Junior High, both the 7^{th}- and 8^{th}-grade Minuteman Engineering Lab classes are "Pass/Fail" and follow a simple rubric consisting of the following:

1. **Safety**: The Minuteman Engineering Exploratory Lab prides itself on a safe atmosphere, allowing all students to enter the classroom confident that they are in no danger and can fully appreciate the lessons and retain the material taught to them.
   a. Safety quizzes MUST BE PASSED WITH 100% GRADES in order to use ANY materials, tools and/or machines associated with the Engineering Lab class work.
   b. The day-to-day workings of the class have a consistent "ZERO TOLERANCE" standard in regard to safety. Therefore, any student seen using tools or materials in an unsafe manner will be asked to leave.
   c. Eye protection is worn when needed, and sometimes when it's not necessary, in order to reinforce the point that safety is number one in the classroom.
   d. Ear protection is made available at machines, and it is highly recommended that students bring in ear plugs or their own forms of ear protection should they find that day-to-day noise, tool operation and/or materials use are irritating their hearing. Safe storage of personal ear protection is available.
2. **Participation**: The Minuteman Engineering Exploratory carries certain expectations concerning the involvement and participation of the students in the class work and lab experiments. All class work consists of "hands-on labs" and relies on the involvement and consistent practice of the material taught in class via demonstrations and short lectures. It is the responsibility of the students to apply themselves and become involved in the many different experiments made available to them throughout the course.
3. **Respect for Others and Themselves**: Along with safety and participation in the class, students are expected to follow the guidelines and rules of behavior as dictated by the School Rules in the RJ Grey Student Handbook.
4. **State Assessment Standards**:
   a. At the beginning of the project, share with your students examples of previous groups' completed investigations. Discuss and develop criteria for effective reports and identify what constitutes quality work.
   b. Students can record their learning in an engineering journal. They can write down each day what they have learned, questions that they may have, resources they found helpful, and resources they need to consult. The teacher should read the journals to monitor students' progress and levels of participation and to identify what topics the students have mastered and which areas of learning need to be reinforced by additional instruction.
   c. Post your Local Wonder report on your school district website, on the town website, or on a town agency's website (e.g., the Chamber of Commerce). Include an e-mail address and encourage feedback.

d. At the end of the unit, provide the students with a photograph of a similar structure from another town or area. Ask them to write a final paper that compares this structure to their own Local Wonder. How are they alike? Different? Compare the materials, designs, and purposes of these structures.

Technology and Health Learning Objectives Addressed in This Course

(This section is for faculty and administrative reference; students and parents may disregard.)

Course activity: skills and/or topics taught	**Standard(s) addressed through this activity**
1] Students will research the internet for ideas and procedures. 2] 3]	

Materials and Resources:

1. Tools and Machines
   a. Band Saws
   b. Drill Presses
   c. Power Belt Sanders
   d. Hot glue guns
   e. Soldering Irons
   f. Battery-powered Hand Drills
   g. Hammers
   h. Screw drivers
   i. Ratchets
   j. Wire cutters
   k. Spring makers
   l. Safety razors (aka retractable box cutters)
   m. Glues, tapes and non-toxic adhesives*
   n. Work gloves (safety requirement)
   o. Safety Goggles (safety requirement)

2. Materials
    a. Pine wood
    b. Masonite
    c. Foam board
    d. Cardboard
    e. Balsa wood
    f. Plastic objects (i.e., pulleys, etc)**
    g. Mig wire stock
    h. Electric motors
    i. Screws, machine bolts, hex nuts
3. Computer Software / Electronic equipment:
    a. Autodesk AutoSketch
    b. West Point Bridge Builder 2006
    c. Microsoft PowerPoint
    d. Microsoft Word
    e. AutoInsight Car Builder
    f. Kelvin Impact Analyzer
    g. Kelvin Bridge Tester
    h. Kelvin Power Supply

*   Note: No cements or adhesives with fumes are used.
** Note: No plastics are melted down.