

DARIEN PUBLIC SCHOOLS

**Technology Education
Grades 7 and 8**

Approved by the Board of Education on November 14, 2006

DARIEN PUBLIC SCHOOLS

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SECTION I - Course Information

STATEMENT OF PHILOSOPHY

The Darien Public Schools Technology Department believes that we should offer a safe, comfortable, and friendly environment where every student, no matter what gender or ethnicity, will be given the opportunity to fulfill their potential. As a department, we feel that a student's understanding of technology and the relationship of technology in their lives will inevitably make them better prepared for the ever-changing world.

Technology is the application of accumulated human knowledge to the transformation of resources through the use of tools for the purpose of meeting human needs and solving problems. The focus of The Technology Education Department at Middlesex Middle School is to educate the students that our subject is the integration of all classroom disciplines, taught in a manner so they can see how learning in all subjects is inter-related and used in their daily lives.

PROGRAM GOALS

Technology Education Department Goals

1. Every student has opportunities to become ultimately responsible for their own education.
2. Every student, no matter what gender or ethnicity, has opportunities to experience the conception and fabrication of their own designs.
3. Every student will have the information needed to independently make informed decisions dealing with technology and its impact on society.
4. All of our students will have the confidence and knowledge to design and fabricate that design.
5. Every student will work either independently or in groups to achieve educational goals.
6. Every student will understand the relationship between science, math and technology and its affect on their lives.
7. Students will learn about careers involving different fields of technology.
8. Students will learn the essential components needed to be successful and empower themselves in a community of learners.
9. Students will learn to use a holistic approach to invent, design, and solve problems.

As a result of an exposure to Technology Education in grades 7-8, students will:

- Evaluate the effects of existing and emerging technologies on people and the environment over time;
- Recognize the scope of technology and evaluate the impact and influence technology has on society, culture and the environment – past, present and future;
- Develop and use ever changing strategies to create interactions with academic fields of study.
- Develop cognitive and psychomotor problem-solving skills through outside research, design, production, operation and analysis of technological systems;

- Properly and effectively promote the use of tools and machines to transform materials into finished products.
- Create devices for solving problems, using creativity and concepts of design technology; and understand the influences of technology on consumer and career choices.

OVERVIEW

The Technology Education Program in the Darien Public School system is based on the philosophy of a hands-on approach to science and math in the real world.

The program starts in the 7th grade with an explanation of common materials and the tools to manipulate them. The 8th grade program builds on that knowledge and uses that information to start the problem-solving component of our program. Open-ended problems dealing with simple machines and engineering challenges are assigned at this level. All students at the middle school are enrolled in Technology Education each day for one quarter in the 7th and 8th grade years. The schedule allows for one eight-week period.

The high school elective program continues with the theme of engineering and design combined with higher order thinking skills. A student may decide to take an introduction to technology course, where numerous engineering fields are studied, or continue in fields of specialty in architectural design, electronics and robotics, woodworking, or advanced engineering classes. The high school department, in keeping to our philosophy, offers hands on physics course, where the course objectives are covered through solving concrete problems and applying learned concepts.

Research indicates that most Americans do not understand the technologies that surround them. The products and systems designed to fill a specific need from water filtration to wheelchairs, from pens to PDAs, people use technology often without fully comprehending how these tools are designed, developed and function. In response, the Technology Education Department at Middlesex Middle School will strive to enhance knowledge of technology and inspire students to continue the study and appreciate technology in their world. We will work closely with educators, administrators, state and national leaders to integrate and present Technology Education as an equal partner to all academic subjects.

ESSENTIAL QUESTIONS

- How is technology integrated in our world?
- How can technology be used to solve sophisticated problems?
- In what ways are engineering and design practices necessary in solving problems related to technology?
- Why is technology instruction important for our students?
- What should students know and be able to do to be technologically literate?

PROCESS SKILLS

- Reading (Decoding)
- Reading (Comprehending)
- Reading (Analyzing)
- Reading (Appreciating)
- Writing and Language Mechanics
- Speaking
- Listening
- Viewing
- Studying
- Reasoning and Reflecting
- Using Learning Resources and Technology
- Working Independently and Collaboratively
- Inventing
- Designing
- Creating
- Quantifying
- Understanding Number Operations
- Using and Creating Formulas
- Problem Solving
- Graphing
- Applying Probability and Statistics
- Applying Scientific Method
- Others

STUDENT PERFORMANCE SUMMARY

Several units will require students to complete a project. Each project will have parameters established by the teacher. Rubrics will be designed for each project and the student's completion of the assigned project within the constraints and dimensions provided will determine the grade.

GRADING GUIDELINES

	<u>Expectations of Students</u>	<u>% of Report Card Grade</u>
Projects	All projects completed	40%
Tests	All tests taken/made up	30%
Quizzes		
Class work		
Homework	100% of all assignments	20%
Class Participation	Positive participation in class	10%
Total		100%

SECTION II – Units of Study

SUMMARY OF UNITS

<u>Unit Title</u>	<u>Duration (Weeks)</u>
Grade 7	
Unit 1: Introduction to Technology	1 week
Unit 2: Materials Processing: Wood	2 weeks
Unit 3: Materials Processing: Plastics	1 week
Unit 4: Materials Processing: Metal	1 week
Unit 5: Materials Processing: Ceramics	1 week
Unit 6: Design	2 weeks
Grade 8	
Unit 1: Engineering	4 weeks
Unit 2: Applied Physics	4 weeks

GRADE 7

UNIT 1 Introduction to Technology

ESSENTIAL QUESTION 1: How is technology evident in our world?

ESSENTIAL QUESTION 2: How is safety an integral part of the design and construction process?

ESSENTIAL QUESTION 3: How does technology impact our lives?

NATIONAL STANDARDS

Students will develop an understanding of the:

- characteristics and scope of technology.
- core concepts of technology.
- relationships among technologies and the connections between technology and other fields of study.
- cultural, social, economic and political effects of technology.
- effects of technology on the environment.
- role of society in the development and use of technology.
- influence of technology on history.

CONTENT KNOWLEDGE OBJECTIVES

INITIAL UNDERSTANDING

The students will:

- **Identify** nomenclature of the Scroll Saw and Drill Press.
- **Demonstrate** the use of the Scroll Saw and Drill Press.
- **Define** technology.
- **Describe** uses of technology in everyday life.

DEVELOPING AN INTERPRETATION

The students will:

- **Decide** which tools to use to complete the assigned task.
- **Explain** the interactions of multiple technologies in their lives.

MAKING CONNECTIONS

The students will:

- **Describe** how technology impacts their lives.
- **Properly** implement the use of tools.

TAKING A CRITICAL STANCE

The students will:

- **Judge** how technology impacts their lives.
- **Evaluate** the trade-offs technology presents.

VOCABULARY

Technology	Scroll Saw
Drill Press	Hand Tools
Universal Model for Systems	Basic Units of Measurement

ACTIVITIES

- Students will complete a class activity sheet defining Technology and its aspects.
- Students will build a project using the Scroll Saw and Drill Press.

PERFORMANCE ASSESSMENT

- Students will be given an operations test on the Scroll Saw and Drill Press.
- Students must score a 70 or better to use the tool.

MATH PROBLEM-SOLVING

Students will understand how to use basic units of measurement.

CAREER AWARENESS

Engineer, product designer, builder, ergonomic designer, architect, chemist, materials engineer

CORE TEXT FOR STUDENTS

N/A

ADDITIONAL TEXTS/ RESOURCES FOR USE BY STUDENTS

N/A

MATERIALS AND SUPPLIES

THE USE OF TOOLS, EQUIPMENT, MATERIALS AND SAFETY

Tool and Equipment Skills Important in This Unit

- Students will use a ruler to measure.
- Students will learn to use a Scroll Saw and Drill Press.
- Students will use a file and abrasive paper.

Specify the safety procedures important in this unit.

Students will demonstrate:

- Appropriate use of protective eyewear
- Safe and proper use tools
- Safe and appropriate practices when cutting, drilling, gluing and assembling.
- An awareness of safety and emergency procedures to be followed in the technology education classrooms.

SUGGESTED MATERIALS AND INFORMATION RESOURCES

Materials important in this unit

The students will require:

- Two pocket folder
- Notebook paper.
- Writing utensil.
- Handouts provided by the teacher.

Equipment important in this unit

- 12 inch ruler
- Scroll Saw
- Drill Press
- Various drills

INTEGRATED TECHNOLOGY

None at this time

UNIT 2 Materials Processing: Wood

ESSENTIAL QUESTION 1: What is the nature of wood as a material?

ESSENTIAL QUESTION 2: How are different woods used in the product development and construction process?

NATIONAL STANDARDS

The students will be able to develop an understanding of the:

- characteristics and scope of technology.
- core concepts of technology.
- effects of technology on the environment.
- role of society in the development and use of technology.
- influence of technology on history.

CONTENT KNOWLEDGE OBJECTIVES

INITIAL UNDERSTANDING

The students will:

- **Identify** the two families of woods.
- **Describe** the process of photosynthesis.

DEVELOPING AN INTERPRETATION

The students will:

- **Explain** the harvesting and processing of the resource.
- **Decide** the proper method of processing of the material.

MAKING CONNECTIONS

The students will:

- **Demonstrate** how to process the material.
- **Explain** some basic wood fabrication steps.

TAKING A CRITICAL STANCE

The students will;

- **Judge** the best method to process the material.
 - **Evaluate** how to best conserve the resource.
-

VOCABULARY

Saw Mill
Technology
Deciduous

End Grain
Edge Grain
Conifer

ACTIVITIES

Students will build a project using the scroll saw and drill press.

PERFORMANCE ASSESSMENT

Student's project will be graded with a rubric.

MATH PROBLEM-SOLVING

Students will use basic units of measurement to lay out the project.

DESIGNING

Students will read and interpret plans for woodworking project.

CAREER AWARENESS (where appropriate)

Engineer, product designer, builder, ergonomic designer, architect, chemist, materials engineer

CORE TEXT FOR STUDENTS

N/A

ADDITIONAL TEXTS/ RESOURCES FOR USE BY STUDENTS

N/A

MATERIALS AND SUPPLIES

THE USE OF TOOLS, EQUIPMENT, MATERIALS AND SAFETY

Tool and Equipment Skills Important in This Unit

- Students will use a ruler to measure
- Students will use a Scroll Saw and Drill Press.

Specify the safety procedures important in this unit.

Students will demonstrate:

- Appropriate use of protective eyewear
- Safe and proper use of wood fabrication tools
- Safe and appropriate practices when cutting, drilling, gluing and assembling.

SUGGESTED MATERIALS AND INFORMATION RESOURCES

Materials important in this unit

The students will require:

- Two pocket folder
- Notebook paper.
- Writing utensil.
- Handouts provided by the teacher.

Equipment important in this unit

- 12 inch ruler
- Scroll Saw
- Drill Press
- Various drills
- Glue
- Hand Flies
- Abrasive paper

INTEGRATED TECHNOLOGY

None at this time

UNIT 3 Materials Processing: Plastics

ESSENTIAL QUESTION 1: What is the nature of plastics as a material?

ESSENTIAL QUESTION 2: How are Thermo-form and Thermo-set plastics used in the product development and construction process?

NATIONAL STANDARDS

Students will develop an understanding of the:

- characteristics and scope of technology.
- core concepts of technology.
- cultural, social, economic and political effects of technology.
- effects of technology on the environment.
- role of society in the development and use of technology.
- influence of technology on history.

CONTENT KNOWLEDGE OBJECTIVES

INITIAL UNDERSTANDING

The students will:

- **Identify** the types of plastics.
- **Explain** the origins of the resource.

DEVELOPING AN INTERPRETATION

The students will:

- **Explain** applications of plastic products.
- **Describe** the characteristics of the material.

MAKING CONNECTIONS

The students will:

- **Demonstrate** how to process the material with the proper tool.
- **Explain** how the raw material is processed.

TAKING A CRITICAL STANCE

The students will:

- **Judge** the best method to process the resource.
- **Evaluate** the positives and negatives of using the resource.

VOCABULARY

Extrusion	Polymer	Foam
Thermo-set	Celluloid	Vacuum forming
Thermo-form	Acrylic	Blow molding
Natural Resource	Bakelite	Injection molding
Polyethylene		

ACTIVITIES

Students will build a project using plastic fabrication tools as directed by the teacher.

PERFORMANCE ASSESSMENT

- Students will be given a test on plastics and their uses.
- Students projects will be graded with a rubric.

MATH PROBLEM-SOLVING

Students will use a ruler to layout the material.

DESIGNING

Students will read and interpret plans to complete the plastics project.

CAREER AWARENESS

Engineer, product designer, builder, ergonomic designer, architect, chemist, materials engineer

CORE TEXT FOR STUDENTS

N/A

ADDITIONAL TEXTS/ RESOURCES FOR USE BY STUDENTS

N/A

MATERIALS AND SUPPLIES

THE USE OF TOOLS, EQUIPMENT, MATERIALS AND SAFETY

Tool and Equipment Skills Important in This Unit

- Students use a ruler to measure
- Students will use a Scroll Saw, Drill Press, Vacuum Former, Strip Heater, Buffer and Injection Molder.

Specify the safety procedures important in this unit.

Students will demonstrate:

- Appropriate use of protective eyewear
- Safe and proper use of tools to form and shape the material
- Safe and appropriate practices when cutting, drilling, gluing and assembling.

SUGGESTED MATERIALS AND INFORMATION RESOURCES

Materials important in this unit

The students will require:

- Two pocket folder
- Notebook paper.
- Writing utensil.
- Handouts provided by the teacher.

Equipment important in this unit

- 12 inch ruler
- Scroll Saw
- Drill Press
- Various drills
- Strip Heater
- Injection Molder
- Vacuum Former
- Hand Flies
- Abrasive paper
- Buffer

INTEGRATED TECHNOLOGY

None at this time

UNIT 4 Materials Processing: Metal

ESSENTIAL QUESTION 1: What is the nature of metal as a material?

ESSENTIAL QUESTION 2: How are Ferrous and Non-Ferrous Metals used in the product development and construction process?

NATIONAL STANDARDS

Students will develop an understanding of the:

- characteristics and scope of technology.
 - core concepts of technology.
 - cultural, social, economic and political effects of technology.
 - effects of technology on the environment.
 - influence of technology on history.
-

CONTENT KNOWLEDGE OBJECTIVES

INITIAL UNDERSTANDING

The students will:

- **Identify** products made of metals.
- **Describe** characteristics of the resource.

DEVELOPING AN INTERPRETATION

The students will:

- **Explain** the applications of metal products.
- **Demonstrate** the proper processing of the material.

MAKING CONNECTIONS

The students will:

- **Describe** how the characteristics of metals affect the design of products.
- **Explain** some basic metal tool fabrication operations.

TAKING A CRITICAL STANCE

The students will:

- **Judge** the best method to process the material.
 - **Evaluate** the impact of the resource on the world.
-

VOCABULARY

Classifications of metals	Ferrous
Non-ferrous	Fatigue
Steel	Brass
Iron	Copper

ACTIVITIES

- Time allowing the students will build a project using metal.
- Students will operate the Squaring Sheer, Brake and Roller.
(if working on a project)

PERFORMANCE ASSESSMENT

- Students will be given a test on metals and their uses.
- Student's project will be graded with a rubric.

MATH PROBLEM-SOLVING

Students will use basic units of measurement when sizing up the material.

DESIGNING

Students will read and interpret plans/schematic drawings to complete metal-working project.

CAREER AWARENESS (where appropriate)

Engineer, product designer, builder, ergonomic designer, architect, chemist, materials engineer

CORE TEXT FOR STUDENTS

N/A

ADDITIONAL TEXTS/ RESOURCES FOR USE BY STUDENTS

N/A

MATERIALS AND SUPPLIES

THE USE OF TOOLS, EQUIPMENT, MATERIALS AND SAFETY

Tool and Equipment Skills Important in This Unit

- Students will learn to use a ruler to measure
- Students will learn to use a Squaring Sheer, Brake and Roller.

Specify the safety procedures important in this unit.

Students will demonstrate:

- Appropriate use of protective eyewear
- Safe and proper use of metal fabrication tools
- Safe and appropriate practices when cutting, drilling, gluing and assembling.

SUGGESTED MATERIALS AND INFORMATION RESOURCES

Materials important in this unit

The students will require:

- Two pocket folder
- Notebook paper.
- Writing utensil.
- Handouts provided by the teacher.

Equipment important in this unit

- 12 inch ruler
- Hack saw
- Drill Press
- Various drills
- Squaring Sheer
- Brake
- Roller
- Aviation sheers

INTEGRATED TECHNOLOGY

None at this time

UNIT 5 Materials Processing: Ceramics

ESSENTIAL QUESTION 1: What is the nature of ceramics as a material?

ESSENTIAL QUESTION 2: How are clay, refractories and glass used in product development and construction?

NATIONAL STANDARDS

Students will develop an understanding of the:

- characteristics and scope of technology.
 - core concepts of technology.
 - relationships among technologies and the connections between technology and other fields of study.
 - cultural, social, economic and political effects of technology.
 - effects of technology on the environment.
 - role of society in the development and use of technology.
 - influence of technology on history.
-

CONTENT KNOWLEDGE OBJECTIVES

INITIAL UNDERSTANDING

The students will:

- **Identify** the types of ceramics.
- **Explain** the uses of the resource.
- **Identify** their source.

DEVELOPING AN INTERPRETATION

The students will:

- **Describe** applications of ceramic products.
- **Explain** proper processing of the material.

MAKING CONNECTIONS

The students will:

- **Describe** how to process the material with the proper tool.
- **Explain** some basic tool operation steps.

TAKING A CRITICAL STANCE

The students will:

- **Judge** the best way to process the material.
- **Evaluate** how the resource is used in everyday life.

VOCABULARY

Classifications of ceramics	Clay
Cement	Pottery
Concrete	Basic units of measurement
Glass	Refractories

ACTIVITIES

- Students will be given teacher demonstrations on types of ceramics and their uses past, present and future.

PERFORMANCE ASSESSMENT

Students will be given a test on ceramics and their uses.

MATH PROBLEM-SOLVING

Students will be given a demonstration on how to determine the weight of the material in relation to the shrinkage rate in relation to the processing of the resource.

CAREER AWARENESS (where appropriate)

Engineer, product designer, builder, ergonomic designer, architect, chemist, materials engineer

CORE TEXT FOR STUDENTS

N/A

ADDITIONAL TEXTS/ RESOURCES FOR USE BY STUDENTS

N/A

MATERIALS AND SUPPLIES

THE USE OF TOOLS, EQUIPMENT, MATERIALS AND SAFETY

Tool and Equipment Skills Important in This Unit

Teacher Demonstration

Specify the safety procedures important in this unit.

Students will demonstrate:

- Appropriate use of protective eyewear
- An awareness of safety and emergency procedures to be followed in the technology education classrooms.

SUGGESTED MATERIALS AND INFORMATION RESOURCES

Materials important in this unit

The students will require:

- Two pocket folder
- Notebook paper.
- Writing utensil.
- Handouts provided by the teacher.

Equipment important in this unit

- 12 inch ruler
- Various samples of ceramics

INTEGRATED TECHNOLOGY

None at this time

UNIT 6 DESIGN

ESSENTIAL QUESTION 1: What is design?

ESSENTIAL QUESTION 2: Why is design so important and how is it applied to materials and their function?

NATIONAL STANDARDS

The students will develop the abilities to:

- **Apply** the design process.
- **Use** and maintain technological products and systems.
- **Assess** the impact of products and systems.

CONTENT KNOWLEDGE OBJECTIVES

INITIAL UNDERSTANDING

The students will:

- **Identify** the aspects of design.
- **Explain** how the design process solves problems in everyday experiences.

DEVELOPING AN INTERPRETATION

The students will:

- **Describe** how different materials might solve the problem.
- **Evaluate** different design options.

MAKING CONNECTIONS (two or more information sources)

The students will:

- **Construct** an object using the design process.
- **Investigate** how things are made and how they can be improved.

TAKING A CRITICAL STANCE

The students will:

- **Judge** which materials will work the best with the design they have drawn.
- **Evaluate** how the materials and the design are interacting.

VOCABULARY

Mass	Velocity	Speed
Flexibility	Acceleration	Impact
Impact	Survivability	Crumple Zones
Force	Inertia	Ejection

ACTIVITIES

- Students will be given a problem to solve.
- Students will use basic design elements to draw a solution to the problem.
- Students will build a project or system to solve the problem.

PERFORMANCE ASSESSMENT

- Student's projects will be graded using a rubric.
- The solution must meet specific criteria and constraints to qualify for grading.

MATH PROBLEM-SOLVING

- Students will review how to use basic inch units of measurement.
- Students will have to use a formula to calculate speed.
- Students will use a scale to measure weight.

DESIGNING

- Students will identify everyday problems that can be solved by design.
- Students will make a two dimensional representation of the designed solution.
- Students will complete the designed solution to the problem before they can begin construction.

ENGINEERING

- Students will use a variety of creativity-enhancing techniques to solve the problem.
- Students will test and evaluate the design in relation to pre-established requirements, such as criteria and constraints and refine as needed.

CAREER AWARENESS

Engineer, product designer, builder, ergonomic designer, architect, chemist, materials engineer

CORE TEXT FOR STUDENTS

N/A

ADDITIONAL TEXTS/ RESOURCES FOR USE BY STUDENTS

N/A

MATERIALS AND SUPPLIES

THE USE OF TOOLS, EQUIPMENT, MATERIALS AND SAFETY

Tool and Equipment Skills Important in This Unit

- Students will use a ruler to measure
- Students will use a Scroll Saw and Drill Press.
- Students will learn how to use a timer.
- Students will learn to use a hot glue gun.

Specify the safety procedures important in this unit.

Students will demonstrate:

- Appropriate use of protective eyewear
- Safe and proper use tools to complete their project
- Safe and appropriate practices when cutting, drilling, gluing and assembling.

SUGGESTED MATERIALS AND INFORMATION RESOURCES

Materials important in this unit

The students will require:

- Two pocket folder
- Notebook paper.
- Writing utensil.
- Handouts provided by the teacher.

Equipment important in this unit

- 12 inch ruler
- Scroll Saw
- Drill Press
- Various drills
- Glue
- Hand Flies
- Abrasive paper

INTEGRATED TECHNOLOGY

Video, PowerPoint, Web searches

GRADE 8

Unit 1: Engineering

ESSENTIAL QUESTION 1: How are the six simple machines applicable in our homes and work?

ESSENTIAL QUESTION 2: How are the simple machines used to transfer energy and motion?

NATIONAL STANDARDS

Students will develop:

- an understanding of the attributes of design.
- an understanding of engineering design.
- an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.
- the abilities to apply the design process.

CONTENT KNOWLEDGE OBJECTIVES

INITIAL UNDERSTANDING

The students will:

- **Identify** the six simple machines.
- **Choose** the simple machines necessary to transfer energy for their invention.
- **Demonstrate** the engineering/inventing process.

DEVELOPING AN INTERPRETATION

The students will:

- **Design** an invention that meets specifications and performs a given task.
- **Construct** an invention that meets specifications and performs a task.
- **Explain** how force is transferred.
- **Decide** what the best simple machine is to perform a given task.

MAKING CONNECTIONS

The students will:

- **Explain** the relationship between a workstation and transferring energy.
- **Explain** the relationship between transferring energy and a simple machine.
- **Describe** the difference between a prototype and the final version.
- **Describe** how simple machines provide mechanical advantage.

TAKING A CRITICAL STANCE

The student will:

- **Judge** the best design for their invention.
- **Evaluate** the problem and engineer a solution to the problem.

VOCABULARY

Input work

Output work

Prototype

Simple machine

Mechanical advantage

Workstation

Pulley

Screw

Wedge

Wheel and Axle

Incline plane

Lever

ACTIVITIES

- Design a Rube Goldberg device based on the current theme and specifications.
 - Construct a frame to support the invention.
 - Select and construct the simple machines to transfer the energy.
 - Calculate the work input/output for each simple machine used.
 - Test and evaluate the prototype invention.
 - Re-engineer the prototype into the final version.

PERFORMANCE ASSESSMENTS

Inventing

Students will invent a Rube Goldberg type device utilizing simple machines; develop a prototype and a final version.

Focus Question for This Task

How do the simple machines increase mechanical advantage and work in series to transmit energy?

Final Product

Students will design and build a device that includes the required simple machines and workstations and completes the assigned task.

CAPT-Equivalency

CAPT-SC

CAPT-M

MATH PROBLEM-SOLVING

- Students will measure the work input/output.
- Students will calculate the mechanical advantage.

ENGINEERING

- The students will invent their Rube Goldberg devise based on the current theme and specifications.
- Students will draw a plan that includes at least eight workstations and includes at least three different simple machines.
- The students will start at the last workstation of their invention, construct, test and modify (reengineer) the workstation and proceed back toward the first workstation.
- The student will test the finished invention and “tweak” the workstations so that it will operate by itself after it is started.

DESIGNING

- The student will utilize thumbnail sketches to develop their own design.
- The students will make a one quarter scale drawing of their design.

CAREER AWARENESS

Engineer, product designer, builder, ergonomic designer, architect, chemist, materials engineer

CORE TEXT(S)

No text required at this time.

ADDITIONAL TEXTS/ RESOURCES FOR USE BY STUDENTS

Internet

<http://www.smartown.com/sp2000/machines2000/main.htm>

<http://teacher.scholastic.com/dirtrep/simple/pulley.htm>

Print (Supplementary)

MacDonald, Bohn, Kuetemeyer, Fales, Energy, Power and Transportation.
Glencoe/McGraw-Hill, Missions Hills, CA 1996

THE USE OF TOOLS, EQUIPMENT, MATERIALS AND SAFETY

Specify The Tool And Equipment Skills Important In This Unit

- The student will use a ruler to measure and cut material to the nearest 1/8 inch.
- The student will use a miter box to cut and construct a frame.
- The student will learn how to use a hot glue gun to assemble a structure.
- The student will learn how to use simple hand tools.

Specify the safety procedures important in this unit.

- The student will wear safety goggles during the activity when necessary.
- The student will learn how to safely use simple hand tools.
- The student will use safe practices when cutting, gluing and assembling.

SUGGESTED MATERIALS AND INFORMATION RESOURCES

Materials important in this unit

The students will require:

- Hot glue sticks (low temp)
- Wood strips for the frame (3/8" x 3/8" x 24")
- Box for storage
- 11 " X 17" graph paper
- Plastic pulleys (assorted sizes 1/4" to 2" dia.)
- Surveyors line (for use with pulleys)
- Dowels (axles for pulleys and fulcrums for levers)
- 1/2" ID plastic tubing (plus 45 deg. And 90 deg elbows)
- Miscellaneous parts (marbles, springs, plastic gears, wire brads and white glue)
- Various other supplies depending on the theme

Equipment important in this unit

- Hot glue gun (low temp)
- 12 inch ruler
- 24 inch ruler
- Miter box
- Cordless drill
- Drill bit assortment
- Try square
- Claw hammer
- Needle nose pliers
- Bench vise
- Drill press
- Table saw
- Band saw
- Scroll saw
- Sanders
- Adequate storage

INTEGRATED TECHNOLOGY

A PowerPoint presentation will be used to introduce the Rube Goldberg activity and the simple machines.

Unit 2: Applied Physics

- **ESSENTIAL QUESTION 1:** What are the factors that influence the speed of a vehicle?
- **ESSENTIAL QUESTION 2:** What is the best design to attain maximum speed and distance while meeting vehicle specifications?

NATIONAL STANDARDS

Students will develop:

- an understanding of the attributes of design.
- an understanding of engineering design.
- an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.
- the abilities to apply the design process.
- an understanding of and be able to select and use transportation technologies.

CONTENT KNOWLEDGE OBJECTIVES

INITIAL UNDERSTANDING

The students will:

- **Measure** the mass of the vehicle
- **Measure** the drag of the vehicle
- **Compute** the velocity of the vehicle.
- **Measure** the distance the vehicle traveled.

DEVELOPING AN INTERPRETATION

The students will:

- **Describe** the relationship between the mass and velocity.
- **Explain** the relationship between drag and velocity.
- **Explain** the relationship of mass, drag and tracking to efficiency.
- **Explain** how efficiency of a design is determined.
- **Design** and construct a vehicle that incorporates minimum drag, minimum weight and tracks.

MAKING CONNECTIONS

The students will:

- **Explain** the relationship between mass, drag and tracking.
- **Compare** mass, acceleration and efficiency.

TAKING A CRITICAL STANCE

The student will:

- **Judge** the efficiency of the design for their vehicle.
- **Evaluate** the problem and engineer a solution to the problem.

VOCABULARY

Aerodynamics	Forces on an aircraft
Acceleration	Airfoil
Drag	Bernoulli's Principal
Parasitic drag	Rudder
Vacuum drag	Nose
Brake drag	Elevator
Dynamic testing	Aileron
First law of motion	Yaw
Second law of motion	Pitch
Third law of motion	Ro

ACTIVITIES

- Design and build a metric racer using a manufactured wooden blank.
 - Measure the mass of finished vehicle.
 - Measure the specifications for the finished vehicle.
 - Measure the drag of the vehicle.
 - Dynamically test the vehicle.
 - Calculate the velocity of the vehicle.
- Build a model airplane using a White wings type design.
 - Identify the parts of an airplane.
 - Test fly and make adjustments.
 - Dynamically test the airplane.
 - Calculate the distance the airplane flew.

PERFORMANCE ASSESSMENTS

Metric Racer and Flight

Velocity of the metric racer

Students will calculate the velocity of their vehicle.

Distance of test flight

Students will calculate the distance of their flight.

Focus Question for This Task

How is the velocity of an object related to the mass and drag?

Final Product

Students will calculate the velocity of their vehicle. The entire activity will be graded with a rubric.

CAPT-Equivalency

CAPT-SC

CAPT-M

MATH PROBLEM-SOLVING

Students will measure the mass of the vehicle.

Students will measure the distance the vehicle travels.

Students will calculate the velocity of the vehicle as it accelerates down the ramp.

Students will calculate the force and drag of the vehicle.

Students will create a graph indicating the mass, velocity and drag.

INVENTING

- The students will invent their own vehicle design.

DESIGNING

- The student will utilize thumbnail sketches to develop their own design.
- The student will use the necessary lines from the alphabet of lines.
- The students will make a full size drawing of their design using CAD software.

GRAPHING

- The student will make a bar or column graph to show the relationship between the mass, acceleration and the drag.

THE USE OF TOOLS, EQUIPMENT, MATERIALS AND SAFETY

Specify The Tools And Equipment Skills Important In This Unit

- The student will use a metric ruler to measure and cut material to the nearest millimeter.
- The student will use the balance to determine mass to the nearest milligram.
- The student will use a digital timer to calculate the acceleration of an object.
- The student will learn how to use various equipment and tools to fabricate the vehicle.
- The student will use a wind tunnel to determine the drag of the vehicle.

Specify the safety procedures important in this unit.

- The student will wear eye protection during the activity when necessary.
- The student will learn how to safely use various machines and tools.
- The student will use safe practices when fabricating and testing the vehicle.

SUGGESTED MATERIALS AND INFORMATION RESOURCES

Materials important in this unit

Metric Racer

The students will require:

- Metric racer blank (wood)
- Front wheels and axles
- Rear wheels and axles
- Screw eyes (2)
- Straws (bearings)
- Brass washers (bearings)
- CO2 cartridge

Flight

- White Wings airplane

Equipment important in this unit

- Digital timer with light gates
- Wind tunnel
- Balance or scale to measure mass
- Test track
- Metric ruler

Video High Speed Impact, Discovery Channel, 2002.

Print (Supplementary)

MacDonald, Bohn, Kuetemeyer, Fales, Energy, Power and Transportation.
Glencoe/McGraw-Hill, Missions Hills, CA 1996

Internet

<http://co2.technologyeducator.com/>

<http://www.wsd.k12.wi.us/Students/IEOcars.html>

SUGGESTED CAREER AWARENESS/EXPLORATION

Engineer, product designer, builder, ergonomic designer, architect, chemist, materials engineer

CORE TEXT(S)

No text required at this time.

SECTION III - Goals and Standards

RELATED GOALS and STANDARDS

TECHNOLOGY EDUCATION CURRICULUM FRAMEWORK

**Connecticut State Department of Education
Division of Teaching and Learning
March 1998**

TECHNOLOGY EDUCATION

By the end of Grade 8, students will know about the nature, power, influence and effects of technology, and will be able to design and develop products, systems and environments to solve problems.

PROGRAM GOALS

As a result of education in Grades 7-8, students will:

- evaluate the effects of existing and emerging technologies on people and the environment over time;
- recognize the scope of technology and evaluate the impact and influence technology has on society, culture and the environment – past, present and future;
- develop and use strategies for adjusting to new technologies and changing interactions among science, technology and society;
- develop cognitive and psychomotor problem-solving skills through applied research, design, production, operation and analysis of technological systems (informational, physical and biological);
- safely and effectively use resources, processes, concepts and tools of technology;
- create devices for solving problems, using creativity and concepts of design and technology;
- understand the influences of technology on consumer and career choices.

K-12 CONTENT STANDARDS

- 1. Economics** Students will understand the link between technology and the economy, and recognize that link as the force behind societal emergence and evolution.
- 2. Technological Impacts** Students will understand the impact that technology has on the social, cultural and environmental aspects of their lives.
- 3. Career Awareness** Students will become aware of the world of work and its function in society, diversity, expectations, trends and requirements.
- 4. Problem Solving/Research** Students will recognize technology as the result **and Development** of a creative act, and will be able to apply disciplined problem-solving strategies to enhance invention and innovation.
- 5. Leadership** Students will identify and develop leadership attributes and apply them in team situations.
- 6. Materials and Processes** Students will know the origins, properties and processing techniques associated with the material building blocks of technology.
- 7. Communications Systems** Students will understand and be able to effectively apply physical, graphic and electronic communications techniques in processing, transmitting, receiving and organizing information.
- 8. Production Systems** Students will understand and be able to demonstrate the methods involved in turning raw materials into usable products.
- 9. Transportation Systems** Students will understand transportation systems and the environments used to move goods and people, and the subsystems common to each.
- 10. Enterprise** Students will demonstrate the techniques of enterprise and how they relate to product and service production, economics, human and material resources, and technology.
- 11. Engineering Design** Students will be able to apply the engineering design process to achieve desired outcomes across all technology content areas.

Listing of STL Content Standards

The Nature of Technology

- Standard 1. Students will develop an understanding of the characteristics and scope of technology.
- Standard 2. Students will develop an understanding of the core concepts of technology.
- Standard 3. Students will develop an understanding of the relationships among technologies and the connections between technology and other fields of study.

Technology and Society

- Standard 4. Students will develop an understanding of the cultural, social, economic, and political effects of technology.
- Standard 5. Students will develop an understanding of the effects of technology on the environment.
- Standard 6. Students will develop an understanding of the role of society in the development and use of technology.
- Standard 7. Students will develop an understanding of the influence of technology on history.

Design

- Standard 8. Students will develop an understanding of the attributes of design.
- Standard 9. Students will develop an understanding of engineering design.
- Standard 10. Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.

Abilities for a Technological World

- Standard 11. Students will develop abilities to apply the design process.
- Standard 12. Students will develop abilities to use and maintain technological products and systems.
- Standard 13. Students will develop abilities to assess the impact of products and systems.

The Designed World

- Standard 14. Students will develop an understanding of and be able to select and use medical technologies.
- Standard 15. Students will develop an understanding of and be able to select and use agricultural and related biotechnologies.
- Standard 16. Students will develop an understanding of and be able to select and use energy and power technologies.
- Standard 17. Students will develop an understanding of and be able to select and use information and communication technologies.
- Standard 18. Students will develop an understanding of and be able to select and use transportation technologies.
- Standard 19. Students will develop an understanding of and be able to select and use manufacturing technologies.
- Standard 20. Students will develop an understanding of and be able to select and use construction technologies.

SECTION IV – Learning Resources

SUPPLEMENTAL RESOURCES

Books

Introduction to Technology
Technology Interactions
Technology Education Learning by Design
Technology Shaping Our World
Understanding Technology
To Engineer is Human
Did Monkeys Invent the Monkey Wrench
The Evolution of Useful Things
The Cartoon Guide to Physics
Understanding Science
Special
Critical Thinking
An Incomplete Education
Unsafe at any Speed
Connecting Civilization the Growth of Communication
Connecting Civilization the Growth of Production

Magazines

Wood
Shop Notes
American Woodworker
The Family Handyman

Videos

Introduction to Manufacturing
What's up in Technology
What's up in Factories
Scroll Saw Safety and Operation
Drill Press Safety and Operation
How a Car is Built
America on the Move
Welding so Hot it's Cool
Staying Alive
a Consumer Reports Car Safety
Making Safer Roads
Advancing Vehicle Safety