Wallenpaupack Area School District

COURSE: Problem Solving

GRADE LEVEL: 9-10

LENGTH OF COURSE: 90 Days

TEXT: Living With Technology

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COURSE DESCRIPTION:

This course is an elective allowing the student the opportunity to integrate academic and applied curriculum offerings with real world problem solving activities. The main focus is to introduce a "problem solving process", while teaching students to "consciously think". The problem solving findings are documented during the problem solving process creating a mapping of the solution. The course will revolve around "solving problems" requiring the production of systems and the selecting and using of appropriate materials, tools and processes. Students may evaluate the performance and impact of the system and modify the solution to improve the performance. Several mini units will lead students through hands on activities that will enhance their understanding of other subject matter taught within the high school curriculum.

CURRICULUM WRITING TEAM:

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DATE OF REVISION:

June 2007

Wallenpaupack Area School District

Course: Problem Solving

Grade Level: 9-10

Unit: I What is technology?

PA Standards: 3.1.10
3.2.10
3.4.10
3.5.10
3.7.10
3.8.10

Topics:	**Skills:**
Technology in a changing World/Making technology work for mankind. Using Technology Seven steps of the technological method of problem solving Structures Forces	Combining simple technologies to create newer and more powerful technologies Explain the positive and negative social outcomes created using Technology Applying Knowledge Application Analysis Synthesis Evaluation
Activities:	**Performance Assessments:**
Lectures Demonstrations Building a Model of a tower using spaghetti Testing and presenting model Design and Build a tower made of spaghetti, test structural integrity to failure and analyze the forces which led to it's collapse Lab Report Work Sheets	Conventional assessments: Quizzes Tests Performance-Based Assessments: Learning Log Short Answers Model building & Testing Lab Reports

Course: Problem Solving

Grade Level: 9-10

Unit: II Safety

PA Standards: 3.2.10
3.7.10
13.2.11
13.3.11

Topics:	**Skills:**
Safety in the lab and work place Effects of accidents on the individuals Effects of accidents on business operations and production costs	Maintaining safe conditions in the lab. Demonstrate safe operations in the lab Applying Knowledge Application Analysis Synthesis Evaluation
Activities:	**Performance Assessments:**
Lectures Demonstrations Create a Safety Poster. Present Safety Poster Lab Report	Conventional assessments: Quizzes Tests Performance-Based Assessments: Learning Log Short Answers Lab Reports

Course: Problem Solving

Grade Level: 9-10

Unit: III Problem Solving Techniques/Resources Of Technology

PA Standards: 3.1.10
3.2.10
3.4.10
3.6.10
3.7.10

Topics:	**Skills:**
The 7 Resources of A Technology System The importance of each Technological Resource. How can we best use the limited resources found on earth. Recycling materials Wood products Thinking Logically Using the seven steps of the technological method of problem solving Simple Machines	Appraising Solving technological problems using all 7 resources of technology wisely Using the six simple machines in solving technological problems Using the seven steps of the technological method of problem solving Applying Knowledge Application Analysis Synthesis Evaluation
Activities:	**Performance Assessments:**
Lectures Demonstrations Work Sheets Lab Report View Video "Why Didn't I Think Of That" View Video "Brain Traps, Problem Solving Skills" • Worksheet Model Building/Problem Solving: • Erect the tallest free-standing paper tower with a limited amount of time and material. • Design and build a structure using graph paper. The structure will support books. • Students will design and construct a paper beam that will support 30 pounds.	Conventional assessments: Quizzes Tests Performance-Based Assessments: Learning Log Short Answers Lab Reports Model building & Testing

Course: Problem Solving

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Unit: IV Problem Solving and Systems

PA Standards: 3.1.10
3.2.10
3.4.10
3.6.10
3.7.10
3.8.10

Topics:	**Skills:**
Systems: Structures, Forces, Movement, Levers, Wheels and Axles, Pulleys, Gears, Cams, and Cranks, Stored Energy Applying the systems approach to Problem Solving Simple Machines Lubricants Aerodynamics	Appraising Solving technological problems using all 7 resources of technology wisely Using the six simple machines in solving technological problems Using the seven steps of the technological method of problem solving Applying Knowledge Application Analysis Synthesis Evaluation
Activities:	**Performance Assessments:**

Lectures
Demonstrations
Work Sheets
Lab Report
View Video “Bridges”
View Video “The Golden Gate Bridge”
Model Building/Problem Solving:
• Build trusses/Shapes from worksheets
• Design and build a bridge
  o From Straws
  o From wood
• Design and build a transportation system to move a poker chip. Minimum of four subsystems required.
• Design and Build a dragster
	Conventional assessments:
	Quizzes
	Tests
	Performance-Based Assessments:
	Learning Log
	Short Answers
	Lab Reports
	Model building & Testing

Course: Problem Solving

Grade Level: 9-10

Unit: V The Electronic Age

PA Standards: 3.2.10
3.4.10
3.6.10
3.7.10
3.8.10

Topics:	**Skills:**
The Electronic age Electron theory Basic Computer systems Electrical components and circuits Series and parallel circuits	Appraising Solving technological problems using all 7 resources of technology Using the computer to research and solve technological problems Wiring an electric motor with a switch. Soldering electrical components Applying Knowledge Application Analysis Synthesis Evaluation
Activities:	**Performance Assessments:**
Lectures Demonstrations Work Sheets Lab Report View Video “The Electric Nation” Model Building/Problem Solving: • Design and build a wired remote controlled vehicle.	Conventional assessments: Quizzes Tests Performance-Based Assessments: Learning Log Short Answers Lab Reports Model building & Testing

Course: Problem Solving

Grade Level: 9-10

Unit: V I Communications

PA Standards: 3.1.10
3.2.10
3.6.10
3.7.10
3.8.10

Topics:	**Skills:**
Various communication systems are explored. Current trends in communications Advertising Utilization of Technological Resources in communication	Appraising Using communication in solving technological problems Problem Solving Applying Knowledge Application Analysis Synthesis Evaluation
Activities:	**Performance Assessments:**
Lectures Demonstrations Work Sheets Lab Reports Model Building/Problem Solving: • Design a new cereal that is to be made and marketed by a large breakfast cereal company.	Conventional assessments: Quizzes Tests Performance-Based Assessments: Learning Log Short Answers Lab Reports Model building & Testing

Course: Problem Solving

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Unit: V II Construction

PA Standards: 3.1.10
3.2.10
3.6.10
3.7.10
3.8.10
13.1.11

Topics:	**Skills:**
Construction, producing a structure on a site. Construction Systems Building a Structure Building construction steps Materials used in building Principal types of roofs Building component terminology	Appraising, Designing, Building Solving technological problems using all 7 resources of technology Using the geometric shapes to design and construct a Crane Evaluating possible construction sites. Analyzing methods to reduce energy consumption in our homes Appraising Applying Knowledge Application Analysis Synthesis Evaluation
Activities:	**Performance Assessments:**
Lectures Demonstrations Work Sheets Lab Report View Video “Extreme Homes” View Video “The Empire State Building” View Video “The Big Dig” Model Building/Problem Solving: • Design and build a Crane • Evaluate, Design, construct a scale model of a residential living environment that uses a minimal amount of land to house a reasonable amount of residences comfortably Tower Building The object of this event is to design and build the lightest tower capable of supporting a given load over a given opening using the given material	Conventional assessments: Quizzes Tests Performance-Based Assessments: Learning Log Short Answers Lab Reports Oral Questioning Research Paper Model building & Testing

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Unit: V III Processing Materials

PA Standards: 3.1.10
3.2.10
3.4.10
3.6.10
3.7.10
3.8.10

Topics:	**Skills:**
Processing Materials Materials Resources Types of industrial Materials Processing Material Resources Forming Separating Combining Conditioning Using Computer to control processing of materials Properties of materials	Using tools to separate materials Using tools to combine materials Using Electricity to condition materials Using tools to Form materials Appraising Applying Knowledge Application Analysis Synthesis Evaluation
Activities:	**Performance Assessments:**
Lectures Demonstrations Work Sheets Lab Report Use of Tools During All Model Building/Problem Solving:	Conventional assessments: Quizzes Tests Performance-Based Assessments: Learning Log Short Answers Oral Questioning Observation Visuals

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Unit: IX Energy / Power

PA Standards: 3.1.10
3.2.10
3.4.10
3.5.10
3.8.10

Topics:	**Skills:**
Energy Energy sources Limited Energy Sources Unlimited Energy Sources Renewable Energy Sources The principles of energy conservation Work and Energy Power Systems Transmissions	Analyze energy sources Distinguish among the principles of force and motion. Explain sources and uses of earth resources. Evaluate possibilities consequences and impacts of scientific and technological solutions Appraising Applying Knowledge Application Analysis Synthesis Evaluation
Activities:	**Performance Assessments:**
Lectures Demonstrations Work Sheets Lab Report View Video “Roller Coaster Thrills” View Video “Roller Coasters” Model Building/Problem Solving: • Design and build a roller coaster to transport a marble from the base of the (1st) main hill to the top of the first hill. The marble will than roll down the hill and continue over a minimum of three more hills and end at the point of the beginning • Design and build a medieval catapult / trebuchet that will hurl a hackie sack at different targets. The contraption must make use of all three classes of levers	Conventional assessments: Quizzes Tests Performance-Based Assessments: Learning Log Short Answers Oral Questioning Observation Visuals Model building & Testing

Course: Problem Solving

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Unit: IX Review

PA Standards: 3.1.10
3.2.10
3.4.10
3.5.10
3.6.10
3.7.10
13.1

Topics:	**Skills:**
Technological Impacts for Today and Tomorrow General review of course	Appraising Applying Knowledge Application Analysis Synthesis Evaluation
Activities:	**Performance Assessments:**
Lectures Demonstrations Work Sheets	Conventional assessments: Exam