'We are living in a world where what you earn is a function of what you learn.'

—President Bill Clinton

School to Work Opportunities Act

MST provides an environment where all students can develop knowledge and skills useful in a science and technology workplace. Not only does the course reach those 75% of the student population who do not pursue baccalaureate degrees, it also appeals to students in the so-called academic track. The course integrates academic and vocational learning to the extent that it simulates the environment in which scientists and technologists uncover knowledge and solve problems, the kind of school-based learning that assists students in their transition from school to work.

In combination with structured work-based learning and attention to connecting activities, MST fulfills purposes of the new federal legislation President Clinton signed into law in May 1994. The School to Work Opportunities Act is a national effort to develop a school-to-work system to assist students in making the transition from school to the adult workforce. The goal of the Act is to create well-marked paths students can follow to move from school to good first jobs or from school to continued education and training.

The Act focuses on broadening educational and career opportunities for all students by encouraging state and local partnerships between businesses and education institutions. The partnerships will help students make the connection between what they learn in the classroom and what they will be required to do in the workplace.

Although administered and funded by the U.S. Departments of Education and Labor, the initiative puts the onus on state and local partners (students, teachers, parents, business, labor representatives, community-based organizations) to build school-to-work systems to benefit their communities. Four major types of grants are available to help states and localities build their own customized systems. However, every school-to-work system must include three core elements: school-based learning, work-based learning, and connecting activities to help bridge the gap between school and work—the kinds of activities that are a part of MST.

The School to Work Opportunities Act was introduced as a result of increasing national concern about students who pursue little or no formal education beyond high school. Currently, 75% of students in the nation attempt to enter the workforce directly from high school or following only 1 or 2 years of college. Many are not successful in moving from school to work, particularly in areas requiring knowledge and skill in science, mathematics, and technology. They lack basic academic and entry-level occupational skills necessary to succeed.

Although originally designed to deal with students not earning a college degree, the final version of the School to Work Opportunities Act stressed that a school-to-work transition system serve all students, even those bound for college. MST is an example of a curriculum that serves this purpose.

MST Course Content Outline

The following course outline is one example of content to be included in an MST course. You can develop your own as you create a program that fits your district.

Introduction

- Materials - The basic nature and properties of materials
- Solid state - Materials divided into two categories: crystalline and amorphous

Body of Course

- Nature of metals - Properties and characteristics of metals
- Nature of ceramics - Properties and characteristics of ceramics
- Nature of glasses - Properties and characteristics of glasses
- Nature of polymers - Properties and characteristics of polymers
- Nature of composites - Properties and characteristics of composites

Topics to be Integrated

- Physical Properties
  - Thermal properties of materials
  - Electrical properties of materials
  - Strength of materials
  - Optical properties of materials
- Chemical properties
- Periodic table of elements
- Methods of scientific inquiry
- Significant developments in the history of materials
- Application of materials
- Systems of technology development

Integrating MST into Existing Classes

Because MST is a study of "stuff," it is a relatively simple task to incorporate much of the MST curriculum into an existing physical science class. Typically, MST materials have been used as an integral part of chemistry, substituting more relevant MST experiments for the recipe format found in a most supplemental chemistry manuals. The following is a brief description of one way to integrate MST materials into sections of a first year chemistry course:

Chemistry Topic	MST Experiments/Demonstrations
Chemical elements	Classification of materials
Metals and their properties	Drawing a wire Crystal structure Alloys Pb/Sn alloy Sterling silver Pewter Metals project
Non-metals	Crystal structure Sulfur and its allotropes Amorphous vs crystalline structure Glass Glass project
Carbon chemistry	Polymers Nylon Soft and hard foams RTV Epoxy Polymers project
Oxidation/Reduction	Raku
Stoichiometry	Formulas for glass Heat change of Zn/Al alloy
Chemistry notebook	MST journal
Chemistry text	MST resources, including teacher guide

Learning Goals

Possible learning goals related to the example content outline are highlighted in the box below. The goals are not meant to be tied to specific units of the MST course.

On completing the course, the student will be able to:

- identify materials specific to our environment
- classify materials as metallic or non-metallic
- classify materials as crystalline or amorphous
- describe through writing and discussion the basic properties of materials: mechanical, thermal, chemical, optical, and magnetic
- characterize materials on the basis of chemical bonding and crystal structure
- demonstrate that the properties of materials can be altered by changing their chemical makeup or physical makeup by treating them in various ways through experiments, projects, and written/oral explanations
- use terms specific to materials science and technology in writing and oral presentations
- demonstrate through writing and oral explanations the application of the powers of observation, measurement, and comparison to analyze materials, their properties, and applications
- demonstrate the basic processes of extracting, preparing, and producing materials used in the course through laboratory exercises and projects
- select materials for specific uses based on the properties, characteristics, and service of the materials
- flourish in an environment of creativity
- demonstrate critical thinking skills through problem solving in manipulating and controlling the materials used in the course
- use writing to record observations, procedures, and experiments and as a tool for thinking, studying, and learning the subject matter
- demonstrate in writing and discussion an appreciation and understanding of significant developments in the history of materials
- select, design, and build a project or projects demonstrating the creative and innovative application of materials
- work in a cooperative group setting to solve problems
- demonstrate practical reasoning, and hands-on/minds-on, problem-solving skills in designing, fabricating, and constructing projects during the course.