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SWOT ANALYSIS: A MANAGEMENT TOOL FOR INITIATING NEW PROGRAMS IN VOCATIONAL SCHOOLS

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ABSTRACT

The SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis has been a useful tool for industry. This article proposes the application of the SWOT tool for use as a decision-making aid as new vocational programs are planned.

The process of utilizing the SWOT approach requires an internal survey of strengths and weaknesses of the program and an external survey of threats and opportunities. Structured internal and external examinations are unique in the world of curriculum planning and development.

Educational examples using the SWOT analysis are provided by the authors. It is a useful way of examining current environmental conditions around program offerings. An insight into the wide range of the potential applications of SWOT is also an intended outcome of this paper.

SWOT ANALYSIS: A MANAGEMENT TOOL FOR INITIATING NEW PROGRAMS IN VOCATIONAL SCHOOLS

The external environment has a profound impact on educational institutions. During this final decade of the twentieth century, America's institutions, economy, society, political structures, and even individual lifestyles are poised for new changes. Recent shifts from an industrial to an information-based society and from a manufacturing to a service-oriented economy has significantly impacted the demands made on vocational program offerings ([Martin, 1989](#)). Vocational programs in comprehensive schools generally cover a broad spectrum of service areas,

but they provide fewer overall programs within each of these areas than are provided in either vocational or specialty schools ([Weber, 1989](#)). Existing programs, and those planned for the future irrespective of the type of school, should be based on a careful consideration of future trends in society.

Vocational administrators should become initiators in shaping the future of their institutions. Strategies must be developed to ensure that institutions will be responsible to the needs of the people in the year 2000 and beyond. To do so requires³/₄among other things³/₄an examination of not only the individual college environment but also the external environment ([Brodhead, 1991](#)). The Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis (also referred to as the TOWS analysis in some management texts), provides a framework for educational administrators to focus better on serving the needs of their communities.

Although originally intended for use in business applications, the idea of using this tool in educational settings is not altogether new. For example, [Gorski \(1991\)](#) suggested this approach to increase minority enrollment in community and other regional colleges. Management tools originally intended for industry can frequently be tailored for application in education due to fundamental similarities in the administrative duties of the respective chief executive officers.

SWOT is a simple, easy to understand technique. It can be used in formulating strategies and policies for the administrator, however, it is by no means an end in itself. The purpose of this paper is to demonstrate how SWOT can be used by administrators to analyze and initiate new program offerings in vocational education.

SWOT IN THE PRESENT CONTEXT

SWOT analysis can be simply understood as the examination of an organization's internal strengths and weaknesses, and its environments, opportunities, and threats. It is a general tool designed to be used in the preliminary stages of decision-making and as a precursor to strategic planning in various kinds of applications ([Johnson et al., 1989](#); [Bartol et al., 1991](#)). When correctly applied, it is possible for a vocational school to get an overall picture of its present situation in relation to its community, other colleges, and the industries its students will enter. An understanding of the external factors, (comprised of threats and opportunities), coupled with an internal examination of strengths and weaknesses assists in forming a vision of the future. Such foresight would translate to initiating competent programs or replacing redundant, irrelevant programs with innovative and relevant ones.

The first step in a SWOT analysis is to make a worksheet by drawing a cross, creating four sectors^{3/4}one each for strengths, weaknesses, opportunities, and threats. An outline of a worksheet is shown in Figure 1. The next step is to list specific items related to the problem at hand, under the appropriate heading in the worksheet. It is best to limit the list to 10 or fewer points per heading and to avoid over-generalizations ([Johnson et al., 1989](#)).

| <u>Potential Internal Strengths</u> | <u>Potential Internal Weaknesses</u> |
|-------------------------------------|--------------------------------------|
| 1. | 1. |
| 2. | 2. |
| 3. | 3. |
| 4. | 4. |
| S | W |
| O | T |

| <u>Potential External Opportunities</u> | <u>Potential External Threats</u> |
|---|-----------------------------------|
| 1. | 1. |
| 2. | 2. |
| 3. | 3. |
| 4. | 4. |

Figure 1. A SWOT worksheet

SWOTs can be performed by the individual administrator or in groups. Group techniques are particularly effective in providing structure, objectivity, clarity and focus to discussions about strategy which might otherwise tend to wander or else be strongly influenced by politics and personalities ([Glass, 1991](#)). [Sabie \(1991\)](#) noted that when working in groups in educational settings, three distinct attitudes emerge among teachers depending on their years of service. Teachers having 0-6 years of experience tend to be the most participative and receptive to new ideas.

The SWOT should cover all of the following areas, each of which may be a source of strengths, weaknesses, opportunities or threats:

Internal environment of the institution

1. faculty and staff

2. classrooms, laboratories and facilities (the learning environment)
3. current students
4. operating budget
5. various committees
6. research programs

External environment of the institution

1. prospective employers of graduates
2. parents and families of students
3. competing colleges
4. preparatory high schools
5. population demographics
6. funding agencies

THE INTERNAL SURVEY OF WEAKNESSES AND STRENGTHS

Historically, administrators seek to attract students to their college programs by increased promotional and advertisement efforts without paying any heed to their institution's strengths and weaknesses. If, indeed, such internal audits are carried out, areas requiring some changes reveal themselves. Furthermore, the potential and possibilities for new services and programs may also emerge. Making a list of internal weaknesses could reveal areas that can be changed to improve the college, also some things that are beyond control. Examples of inherent weaknesses are quite numerous. A few are listed as follows: low staff and faculty morale; poor building infrastructure; sub-standard laboratory and workshop facilities; scarce instructional resources; and even the location of the institution within the community.

Seldom do weaknesses occur in isolation; strengths are present and need to be enlisted as well. Examples of potential strengths could be: (a) a reasonable tuition fee charged from students; (b) strong and dedicated faculty with a high morale; (c) articulation with other four-year colleges and universities which would enable students to transfer course credits; (d) a strong reputation for providing the training required to get entry-level employment; and (e) diversity among the student population.

Minority enrollment and retention is a particularly important emerging issue because vocational schools have a mission to education people from all sectors of society ([Gorski, 1991](#)). Demographic projections have predicted a two- to four-fold accelerated growth of Hispanic and Afro-American population relative to the white majority, and this will be reflected in the number of job seekers ([Crispell, 1990](#)).

The assessment of strengths and weaknesses are also facilitated through surveys, focus groups, interviews with current and past students, and other knowledgeable sources. Once weaknesses and strengths are delineated, it would be appropriate to reconfirm these items. It should be recognized that different perceptions may exist depending on the representative group consulted. Figure 2 depicts an example using a SWOT analysis.

| | |
|--|--|
| <i>BACKGROUND INFORMATION:</i> Consider a community technical college that is planning to add some new programs. Assume that, during previous brainstorming sessions, several ideas emerged and a program in laser technology is being strongly contemplated by the department chair and other faculty. The department or the chair and a select group of faculty could meet and conduct a SWOT analysis to help develop a strategy. The following points may appear on the worksheet. | |
| <u>Potential Internal Strengths</u> | <u>Potential Internal Weaknesses</u> |
| 1) Existing electronics and electrical programs could provide some basics required for a laser technology program. | 1) Current faculty are not well versed in laser technology. |
| 2) Faculty who are enthusiastic and willing to go the extra mile to acquire knowledge and training in lasers. | 2) Lack of sufficient space for the required extra equipment. |
| 3) Sufficient funds to invest in high technology programs. | 3) Current safety features are not adequate for handling potential hazards such as lasers. |
| 4) Successful experiences in the past with new, dynamic programs, thus, expertise in dealing with change. | 4) A faction in the faculty want a program in microprocessor technology rather than in laser technology. |
| W | S |
| O | T |
| | |
| <u>Potential External Opportunities</u> | <u>Potential External Threats</u> |
| 1) Local area hospitals, metal industries and communication companies suffer from a critical shortage of laser technologists. | 1) The technical college in a nearby county has already taken a lead and possesses the infrastructure to start a laser technology program any time soon. |
| 2) State and nation-wide demand for laser technologists is projected to increase for the next 10 years. | 2) Programming many not get approval from the board because of previous history of accidents of the college. |

| | |
|--|---|
| 3) Local high school teachers' and students' enthusiasm for the proposed program could result in recruiting the best students. | 3) Some efficient and cheaper alternatives to laser devices are appearing in recent literature which, if true, will not hold a bright future for prospective laser technologists. |
| 4) Expert laser technologists in area hospitals and industries have offered to give their expertise on a part-time basis. | 4) High school students in the area indicate a preference for business programs rather than technical ones. |

Figure 2. Sample SWOT analysis used to consider the feasibility of initiating a laser technology program

EXTERNAL SURVEY OF THREATS AND OPPORTUNITIES

The external look is complementary to the internal self-study in a SWOT analysis. National and regional influences^{3/4}as well state and local concerns^{3/4}are of paramount importance when deciding what new programs need to be added or which existing ones need to be modified or removed. [Gilley et al. \(1986\)](#) identified ten fundamentals of institutions that are "on-the-move", one of which is the ability of institutions to maintain a close watch on their communities. Not only must administrators keep an eye on the community, but they must also play a leadership role by addressing relevant issues.

Information about the current business climate, demographic changes, and employment and high school graduation rates should be considered in this phase of the study. A multitude of sources include^{3/4}but are not limited to^{3/4}parents and community leaders, local newspapers, national news magazines, higher education journals, conferences, the local industrial advisory council, and local business contacts. Each of these is a potential source of highly valuable information.

Threats need to be ascertained. They come in various forms. Increasingly, restrictive budgets for vocational education are a rule rather than an exception. An anticipated cut in state or federal funding can have a significant impact on implementing a high-budget program. Nearby universities and other local area colleges may be planning some new changes to attract more students to their programs. In addition, a decreasing number of high school graduates in the region and surrounding areas may pose a considerable threat by way of reduced student demand for some planned programs.

An awareness of demographic changes in the local population can reveal potential opportunities to address new issues and pave the way for a more meaningful education. There could exist a pattern of preferences among the various minority or cultural groups. Public concern for the global environment is relatively new and this may represent an area of opportunity. Newer industries or businesses could emerge in the near future, seeking well-trained graduates.

It should be recognized that opportunities and threats are not absolute. What might at first seem to be an opportunity, may not emerge as such when considered against the resources of the organization or the expectations of society. The greatest challenge in the SWOT method could probably be to make a correct judgment that would benefit both the institution and the community.

DRAWBACKS OF SWOT

SWOTs usually reflect a person's existing position and viewpoint, which can be misused to justify a previously decided course of action rather than used as a means to open up new possibilities. It is important to note that sometimes threats can also be viewed as opportunities, depending on the people or groups involved. There is a saying, "A pessimist is a person who sees a calamity in an opportunity, and an optimist is one who sees an opportunity in a calamity." In the example provided in Figure 2, the opportunity provided by experts in industry to train students may be viewed by faculty members as a threat to their own position and job.

SWOTs can allow institutions to take a lazy course and look for 'fit' rather than to 'stretch'—they look for strengths that match opportunities yet ignore the opportunities they do not feel they can use to their advantage. A more active approach would be to involve identifying the most attractive opportunities and then plan to stretch the college to meet these opportunities. This would make strategy a challenge to the institution rather than a fit between its existing strengths and the opportunities it chooses to develop ([Glass, 1991](#)).

SUMMARY

A SWOT analysis can be an excellent, fast tool for exploring the possibilities for initiating new programs in the vocational school. It can also be used for decision making within departments and committees or even by individuals. A SWOT analysis looks at future possibilities for the institution through a systematic approach of introspection into both positive and negative concerns. It is a relatively simple way of communicating ideas, policies, and concerns to others. It can help administrators to quickly expand their vision. Probably the strongest

message from a SWOT analysis is that, whatever course of action is decided, decision making should contain each of the following elements: building on Strengths, minimizing Weaknesses, seizing Opportunities, and counteracting Threats.

In order to be most effectively used, a SWOT analysis needs to be flexible. Situations change with the passage of time and an updated analysis should be made frequently. SWOT is neither cumbersome nor time-consuming and is effective because of its simplicity. Used creatively, SWOT can form a foundation upon which to construct numerous strategic plans for the vocational school.

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NEIGHBORHOOD VALUE ANALYSIS

Chapter 6

Objectives

- ⊕ Understand the essentials of a neighborhood.
- ⊕ Discuss the neighborhood life cycle.
- ⊕ Know how neighborhoods are delineated.
- ⊕ Appreciated the nature of neighborhood characteristics.
- ⊕ Recognize amenities that enhance the appeal of neighborhoods.
- ⊕ Know major attributes of commercial and industrial districts.

I. Neighborhood

- A. A neighborhood is a bounded area wherein certain land use activities are attracted and retained by sets of linkages.
- B. Linkages define a neighborhood and hold it together.
 - 1. A link may be economic, like a machine shop that subcontracts for another nearby business.
 - 2. A link could be social, perhaps tied to a school.
 - 3. Links could be religious or ethnic.
 - 4. A neighborhood in Argentina is organized around a sports franchise. All the homes are painted in the team colors, blue and gold.

II. The neighborhood age cycle a valuation

- A. Just as a building has a life cycle, so does a neighborhood.
- B. As we review the life cycle of a neighborhood, remember that the time frame for each period will vary for reasons including, but not limited to
 - 1. Original building quality
 - 2. The underlying social fabric
 - 3. The soundness of the local economy.
- C. The cycle
 - 1. Development period, 20 years.
 - 2. Maturity, 20-25 years. Property values peak.
 - 3. Decline, 25-40 years. Property values begin to fall.
 - 4. Transition to lower economic inhabitants, 45-80 years.
 - a. Families from lower income groups start moving into the area.
 - b. Eventually the lower income groups dominate the neighborhood.
 - 5. Period of blight, 80-100 years.
 - a. The process of lower income groups "infiltrating" and "overtaking" the neighborhood is repeated.

- b. Gentrification. Occasionally, blighted neighborhoods with architecturally appealing homes are purchased and restored by individuals from higher income groups.

III. Neighborhood characteristics

A. Physical

1. Location within the city
2. Nature of terrain
3. Nature and load-bearing capacity of soil
4. Features of natural beauty
5. Drainage facilities
6. Street pattern and street improvements
7. Type of architecture and quality of housing
8. Nature, frequency, and cost of public transportation (not too important here, but in cities like Washington DC, New York, and San Francisco, it is important)
9. Proximity to schools, stores and recreational facilities
10. Freedom from environmental hazards.

B. Population

1. Income and education of residents
2. Living habits and care of homes
3. Attitude toward law and government
4. Homogeneity of cultural and civic interests
5. Age grouping and size of families

C. Economic influences

1. Percentage of neighborhood that is developed.
2. Percentage of homes occupied by the owner.
3. Professional or occupational means of earning a living and income stability (notice that this is highly correlated with item 1 under population.
4. Taxation and assessment levels, and the tax burden.
5. Zoning and deed restrictions.
6. Investment quality of area for VA, FHA, and institutional mortgage loan financing.
7. Price range and rental value of neighborhood homes.

IV. Neighborhood boundaries

A. It is important for an appraiser to know the boundaries because it

1. helps refine the search for comparable properties.
2. makes it possible to determine the condition of the neighborhood.
3. makes it possible to determine the highest and best use of land.

B. How are the boundaries of a neighborhood determined?

1. Physical barriers such as rivers, lakes, and mountains, as well as made made features such as highways and railroads.

- 2. Legal and government features such as subdivisions, school districts, and zoning districts.
 - C. Established by prices of residences
- V. Location characteristics in determining value
 - A. First, determine the boundaries of the neighborhood.
 - B. The terrain may influence development
 - 1. Some land is hard to build on.
 - 2. For residential development, gently rolling land is preferred to a flat plateau or low lying land. People prefer land with a view.
 - C. Quality of the soil affects building costs, and may limit the activities that can be conducted on the property.
 - D. Features of natural beauty
 - E. Soil drainage
 - F. Impact of neighborhood street patterns and street improvements. For improved, but undeveloped land, the improvements compose 60 to 90% of the property value.
 - G. Observe the type of architecture and the quality of housing. Homes should be of a like architecture, but avoid being monotonous.
 - H. Is there good public transportation relative to other neighborhoods.
 - I. Report distances to stores, schools, churches, central business district, etc.
 - J. Check on health hazards and environmental influences.
- VI. Social forces influencing neighborhood values
 - A. Living habits
 - B. Care of property
 - C. Attitude toward government. Respect for law enforcement agencies and the courts reduces vandalism.
 - D. Similarity of cultural interests
 - E. The National Fair Housing Act of the Civil Rights Act of 1968 makes it unlawful to discriminate in the sale, rental, or financing of real estate on the basis of race, color, religion, sex, or national origin.
 - 1. The appraisal affects all three areas of real estate.
 - 2. In addition to being illegal, it is also unethical for an appraiser to discriminate based on these factors.
 - 3. Each property should be judged on its own merit.
- VII. Neighborhood economic characteristics are reflected in the value of properties. (See the Uniform Residential Appraisal Report section titled, "Neighborhood.")
 - A. The extent or percentage of neighborhood development.
 - 1. Some neighborhoods are developed with under a "boom" mentality.
 - a. Prior to full development, these neighborhoods can suffer more rapid economic decline than more fully developed neighborhoods.

- b. Studies have found that 50% development or above is "safe" range, and appraisers do not need to deduct value for lack of development.
 - c. The Uniform Residential Appraisal Report asks if development exceeds 75%, is between 25 and 75%, or under 25%.
 - 2. Many less developed neighborhoods are built on a solid economic base, and should not receive the same discount in value.
 - 3. The appraiser needs to determine the soundness of the economic underpinnings of the neighborhood.
 - B. If the neighborhood is residential, the appraiser must learn what proportion is owner occupied.
 - 1. Because owners gain from capital appreciation when they make investments in the home, and renters do not gain financially, the owner is more likely to improve the property.
 - 2. Even good tenants are transient in nature, adding instability to a neighborhood.
 - C. Frequency of property turnover
 - 1. A high frequency of turnover implies the neighborhood is not stable.
 - 2. Vacancies in excess of 2 to 7 percent of the total supply indicated excess supply.
 - D. Two important economic characteristics of neighborhood occupants that affect value.
 - 1. The level of income. High income occupants can buy more expensive homes and maintain properties more easily.
 - 2. Some occupations, though not high income, are stable.
 - E. Impact of taxation and assessment levels.
 - 1. There is a life cycle of taxation.
 - a. New, fast growing neighborhoods generally have crowded schools, over burdened services, and low taxes.
 - b. As the neighborhood matures, residents demand better service. Tax rates increase.
 - 2. Heavy assessments could drive down property values.
 - 3. Cities and counties must strike a balance between adequate services that add to property value, and heavy assessments that decrease property value.
 - F. Zoning and private deed restrictions
 - 1. Home buyers rarely know about these restrictions.
 - 2. Appraisers must be aware of this information.
 - G. Neighborhood property values are supported by FHA, VA, and other sources of mortgage financing.
 - H. Establish a price range for the neighborhood. A typical range may be from 25% to 50% of average sales values.

- I. An appraisal must review environmental factors.
- VIII. Neighborhood analysis in form reports
 - A. Location is classified as
 - 1. Urban
 - 2. Suburban
 - 3. Rural
 - B. Built-up and growth rate
 - 1. Areas that are under 25% built up do not qualify for maximum financing (Fannie Mae) due to the higher risk associated with raw land.
 - 2. Areas between 25 and 75% built up are eligible for maximum financing.
 - 3. Areas over 75% that have not entered a period of decline are eligible for maximum financing.
 - C. Property values. Fannie Mae financing is only available where property values are increasing or stable.
 - D. Demand/supply
 - 1. Shortage
 - 2. In balance
 - 3. Over supply
 - E. Marketing time when a normal selling period for a residence is six months. The form considers
 - 1. Under 3 months
 - 2. 3 to 6 months
 - 3. Over 6 months
 - F. Present land use. Value is enhanced by the existence of other properties with similar use and value.
 - G. Land use change
 - 1. Residential to commercial
 - 2. owner occupied to tenants
 - H. Single family housing.
 - 1. Price range and predominant price
 - 2. Age
 - I. Neighborhood analysis rating are used to document below and above average neighborhoods.
 - 1. Factors that affect the marketability of the properties in the neighborhood...
 - 2. Market conditions in the subject neighborhood...
- IX. Neighborhood attributes of retail districts
 - A. The growth of shopping centers has decreased the importance of central business districts.
 - B. Types of shopping centers.
 - 1. Convenience center
 - a. 30,000 to 40,000 square feet.
 - b. serves a population of 10,000 to 20,000.
 - c. Serves a 2-mile radius.

2. Community center
 - a. 125,000 to 175,000 square feet.
 - b. Serves a population of 40,000 to 100,000.
 - c. Serves a 4 to 5 mile radius.
 3. Regional center
 - a. 300,000 to 1,000,000 square feet.
 - b. Serves a population of at least 150,000.
 - c. Serves population within a 30-minute drive.
- X. Office districts types
- A. Single tenancy
 - B. Multi tenancy
 - C. Special use
 - D. General purpose
 - E. Ownership form
- XI. Industrial district attributes
- A. Types of districts
 1. Centrally located industrial districts
 2. Planned industrial parks
 3. Attributes that are desirable
 - B. Industrial districts should have the following characteristics
 1. Ample supply of utilities
 2. Access to markets
 3. Skilled work force
 4. Adequate transportation access
 5. Easy commuting to residential areas
 6. Comparability with surrounding areas
 7. Reasonably level land
 8. Locations that facilitate on-site pre-treatment of waste.



Common Hazards Found in Public Schools

Revised April 1997

This educational bulletin contains information on the common hazards found in schools. Topics covered include: 1) roof renovation, painting and construction work, 2) indoor air quality, 3) carpeting, 4) carcinogens, 5) woodworking shops, 6) science laboratories, 7) darkroom - photodeveloping, 8) art rooms - kilns, 9) art rooms - sculpturing and 10) art rooms - silk-screen printing.

1. Roof Renovation, Painting and Construction Work

The Public Employees Occupational Safety and Health (PEOSH) Program has received numerous complaints from building occupants who have stated that they experienced health symptoms from renovation activities. Health effects associated with vapors and dusts generated by these activities include eye irritation, upper respiratory irritation, nausea and dizziness, lightheadedness, headache and irritability.

Roof Renovation: Several different types of roofing applications are available. While older methods include applying coal-tar pitch and asphalt, newer roofing technologies use rubber or other synthetic membranes as roofing materials. Each type of roofing application should be evaluated for the potential for releasing chemical contaminants.

Studies by the National Institute for Occupational Safety and Health (NIOSH) have documented health problems can occur from exposure to coal-tar pitch products during roofing operations. Roof removal operations may release coal-tar pitch dust that contains polynuclear aromatic hydrocarbons (PAH's).

Rubber or synthetic membrane applications use organic solvents in adhesives, primers, sealants and hardening agents. During the application of poly-urethane roofing, methylene-bisphenyl-isocyanate and organic solvent vapors may be released which can cause adverse health symptoms.

Painting: Painting may introduce many chemicals into the indoor environment. In addition to paints, other products such as strippers, primers, and thinners may also be used. The solvents and additives found in paints, strippers, primers, and thinners may cause indoor air quality problems, due to the evaporation and aerosolization of the solvents and additives found during and after application.

Paints are usually described by the solvent systems utilized in their formulations. The two common types of paints are:

- ?? alkyd - hydrocarbon solvent based and usually a higher volatile organic compound (VOC) content;
- ?? latex - water based and usually a lower VOC content.

The amount of VOCs present in paints and released into the indoor environment may contribute to indoor air quality problems during painting operations. Paint manufacturers have formulated paints that have lower VOCs, but these paints tend to be thicker and more difficult to apply. Some companies are producing paints from "natural" products.

These paints are not considered to be hazard free, but they are developed from substances which are less harmful.

Construction and Demolition Work: Construction and demolition work usually creates nuisance dust. The greatest amount of dust may be generated during sweeping. If good housekeeping practices are not used, this may lead to excessive dust in the work area, which may cause adverse health effects for building occupants.

What can be done to reduce potential health hazards?

The PEOSH Indoor Air Quality Standard contains requirements for building renovation. The regulation requires renovation or new construction that results in the diffusion of dust, stone and other small particles, toxic gases or other harmful substances in quantities hazardous to health be safeguarded by local ventilation or other protective devices to ensure the safety of employees.

Renovation areas in occupied buildings must be isolated and dust and debris must be confined to the renovation or construction area. Examples of isolation measures may include:

- ?? seal off the work area;
- ?? shutting down ventilation system and sealing the supply and return grilles;
- ?? maintaining the work area under negative pressure in relation to adjacent areas;
- ?? good housekeeping practices in the work area.

Before using paints, adhesives, sealants, solvents, or installing insulation, particle board, plywood, floor coverings, carpet backing, textiles, or other materials, the employer must check product labels or obtain information from the manufacturers of those products on whether or not they contain volatile organic compounds such as solvents, formaldehyde, or isocyanates that could be emitted during regular use. This information must be used to select products and to determine necessary measures to be taken.

The employer must notify employees at least 24 hours in advance, or promptly in emergency situations, of work to be performed on the building that may introduce air contaminants into the work area.

Although not part of the regulation, the following actions may be necessary:

- ?? employees should be relocated if they are sensitized to products or materials being used in renovation or construction;
- ?? employees should be informed of the location and how to obtain material safety data sheets (MSDS) and [New Jersey Right to Know Hazardous Substance Fact Sheets \(HSFS\)](#) for products being used during construction and renovation. The MSDS can be obtained from the contractor or the manufacturer of the product. The HSFS can be obtained by contacting the New Jersey Department of Health and Senior Services, Right to Know Program, at (609) 984-2202;

In addition, if the above control measures are not adequate, then work may need to be performed when the building is not occupied.

2. Indoor Air Quality

The World Health Organization estimates that approximately 30 percent of all buildings have an indoor air quality (IAQ) problem. Much research and attention has been focused on a whole host of indoor air contaminants and stressors in office buildings as well as in the home. Asbestos, formaldehyde, radon, bacteria, fungi, carbon monoxide, hydrocarbons, particulates, nitrogen oxides, ozone, fiberglass, tobacco smoke, temperature, humidity and poor ventilation top the list. Any of the aforementioned may be a cause of IAQ problems.

Employee symptoms associated with IAQ problems may include eye, nose, throat, and upper respiratory irritation, skin irritation or rashes, chills, fever, cough, chest tightness, congestion, sneezing, runny nose, muscle aches, and pneumonia. Illnesses associated with IAQ problems include asthma, hypersensitivity pneumonitis, multiple chemical sensitivity, and Legionnaires' Disease.

How can IAQ problems be corrected and/or prevented?

- ?? Ensure an adequate outside air supply. The ventilation system should be operating at original design specifications.
- ?? Eliminate or control known and potential sources of air contamination, both chemical and microbial.

What can be done if the air quality is unacceptable?

- ?? Conduct employee interviews to obtain pertinent information regarding what symptoms are being experienced, how many employees are affected, when they are affected, where they work, what they do, etc.
- ?? Review building operations and maintenance procedures to determine when and what type of chemicals are being used during cleaning, floor waxing and stripping, painting, gluing, pesticide spraying, roofing operations, renovation and construction activities, etc. Also determine when deliveries, which may generate vehicle exhaust, occur, or if furniture, drapery, and office equipment has been recently installed.
- ?? Conduct a walk-through inspection to evaluate possible sources that may contribute to IAQ complaints.
- ?? Inspect the HVAC system, window air conditioners, office dehumidifiers, etc., in order to determine if the systems are working properly and are in good condition.
- ?? Review the building blueprints of the duct work and ventilation system to determine if the system is adequately designed.
- ?? Conduct air sampling, if necessary, to determine if specific contaminants are present or if adequate fresh air is being supplied.

*For more information on this subject, obtain the PEOSH informational bulletin on **Indoor Air Quality**.*

For more information on the PEOSH Indoor Air Quality standard (N.J.A.C. 12:100-13) obtain the PEOSH information bulletin [PEOSH Indoor Air Quality Standard](#) or the standard at [IAQDOC.PDF](#).

3. Carpeting

The PEOSH Program has received numerous complaints from building occupants who have stated that they have experienced health symptoms related to the installation or maintenance of carpeting. Carpeting and the adhesives used to glue it down may contain many chemicals, some of which may cause adverse health effects. These chemicals can be found in carpet fiber bonding materials, backing glues, solvents, anti-static and anti-stain treatments, fire retardants, pesticides and fungicides. Most commercial carpeting comes with a styrene-butadiene latex rubber backing. It is used wall-to-wall and glued rather than tacked down so that it doesn't move when heavy office furniture and file cabinets are moved.

Carpeting may be shipped from the factory in plastic-covered rolls. When it is unrolled for installation, certain chemicals (called volatile and semi-volatile chemicals) may be released into the air. The chemicals may continue to off-gas from days to months. Potential adverse health effects depend on what type of carpeting is installed, how much adhesive is used, and how much fresh air is being circulated in the building by the ventilation system. Health complaints have also been associated with cleaning products used to shampoo carpets, mold growth on carpets, and allergic reactions to mites and their dander in carpeting.

What can be done to reduce potential health hazards?

- ?? Limit the use of carpeting in the workplace.
- ?? Never use carpeting where persistent moisture may be present.
- ?? Before carpeting is installed, make certain that it is properly aired out.
- ?? When removing old carpeting, first vacuum it thoroughly.
- ?? Relocate workers during installation.
- ?? Isolate and ventilate the work area.
- ?? Keep the carpet clean and dry.
- ?? Use the least volatile adhesive.

4. Carcinogens

A review of the 1990 New Jersey Right to Know Surveys found that many school districts listed a number of carcinogens (a carcinogen is a substance that causes cancer) on their surveys. The ten most reported carcinogens were arsenic, arsenic trioxide, asbestos, benzene, benzidine, lead chromate, sodium arsenate, sodium arsenite, sodium dichromate, and vinyl chloride. Of the 575 public school districts in New Jersey, 318

(55%) reported one or more of these carcinogens on their 1990 Right to Know Survey. Most of the school districts have reported that they had disposed of or planned to dispose of the carcinogens.

What can be done to control the use of carcinogens?

- ?? Carefully review the use of any carcinogens in the school. The list of known and suspected human carcinogens can be obtained from the PEOSH Program.
- ?? Substitute less hazardous substances (except for benzene in gasoline or fuel for which there is no substitute).
- ?? Review the Material Safety Data Sheets for information on the hazards of the new products.

5. Woodworking Shops

Traditional woodworking shops use woodworking machinery such as band saws, circular saws, planers, belt sanders, lathes and routers which are noisy and can emit dust into the air.

A wide range of adhesives are used for bonding wood. The most commonly used adhesives are synthetic and may contain formaldehyde; some also contain organic solvents. Any of these synthetic adhesives may re-lease chemicals into the air. Health effects associated with low level exposure to solvents include dizziness, headaches, nausea, drowsiness, loss of balance and vomiting. Some vapors used in adhesives are flammable in air and precautions should be taken to eliminate sources of ignition in the work area.

What can be done to reduce potential health hazards?

- ?? Woodworking machines with high-speed cutting tools such as saws, planers and routers should have exhaust ventilation equipment to collect sawdust and wood shavings at the source.
- ?? When working with adhesives that contain organic solvents, work in a well ventilated area.
- ?? Various products are used to finish wood-working projects; some of these finishes contain organic solvents which have the potential for creating health problems if over-exposure occurs. By substituting a water-based product, potential airborne organic vapors can be reduced.
- ?? Wear latex-nitrile or neoprene gloves when working with organic based solvents.
- ?? Wear rubber or synthetic type gloves when working with water based solvents.
- ?? Evaluate noise exposures.

For more information on this subject refer to "Safe Schools: A Health and Safety Check," Checklists on Woodworking Machinery, pages 293-304 and Noise Generating Operations, pages 327-332.

6. Science Laboratories

The PEOSH Program has adopted the Occupational Exposure to Hazardous Chemicals in Laboratories Standard. The PEOSH Laboratory Standard is de-signed to protect public employees from intermittent exposure to a broad range of chemicals encountered in laboratories. The standard addresses the specific concerns which make laboratory activities different from industrial activities in the use and handling of hazardous chemicals. The standard covers all laboratories engaged in the use of "hazardous chemicals" in accordance with the definition of "laboratory use" and "laboratory scale" as provided in the standard.

Laboratory Scale: This means that chemicals are used in such a way that the containers used for reactions, transfers, and other handling of substances are designed to be easily and safely handled by one person. Laboratory scale excludes workplaces whose function is to produce commercial quantities of materials.

Laboratory Use of Hazardous Chemical: This means the handling or use of hazardous chemicals in which all of the following conditions are met:

- ii. Multiple chemical procedures or chemicals are used;
- iii. The procedures involved are not part of a production process, nor in any way simulate a production process;
- iv. Chemical manipulations are carried out on a "laboratory scale."
- v. Protective laboratory practices and equipment, such as laboratory hoods, are available and in common use to minimize the potential for employee exposure to hazardous chemicals.

The standard does not cover laboratories where the use of a chemical provides no potential for employee exposure (e.g., the use of "Dip and Read" tests involving reagent strips or the use of commercially pre-pared kits, such as pregnancy tests).

What can be done to reduce potential health hazards?

Chemical Hygiene Plan (CHP): Develop and write a CHP that contains:

- ?? Standard operating procedures;
- ?? Exposure control measures including engineering controls, personal protective equipment, and personal hygiene practices;
- ?? Requirements for properly functioning fume hoods and other protective equipment;
- ?? Provisions for medical consultation and medical examinations;
- ?? Designation of a chemical hygiene officer;
- ?? Establishment of a chemical hygiene committee;
- ?? Establishment of a hazard identification system;
- ?? Establishment of a respiratory protection program;
- ?? Establishment of a recordkeeping procedure.

For more information on this subject, obtain the PEOSH information bulletin **PEOSH Occupational Exposure to Hazardous Chemicals in Laboratories Standard** and the Model Written Chemical Hygiene Plan (Download: [labstand.zip in WordPerfect 6.1 for Windows format](#) or [LABSTAND.PDF](#)(11KB - an Adobe PDF file).

7. Darkrooms - Photodeveloping

The chemicals used in photography darkrooms for black and white film processing may cause skin problems and possible lung problems through inhalation if overexposure occurs. For example, the developers used often contain hydroquinone and monomethyl p-amino-phenol sulfate which may cause skin irritation and allergic reactions. The fixer usually contains sodium sulfite, acetic acid, sodium thiosulfate, boric acid, and potassium alum. Sodium thiosulfate and the mixture of sodium sulfite and acids produce sulfur dioxide, which is highly irritating to the lungs.

Color processing contains many of the same chemicals found in black and white processing as well as dye couples in developers, which may cause severe skin problems. Some solutions may contain toxic organic solvents such as formaldehyde.

What can be done to reduce potential health hazards?

- ?? Supply adequate ventilation in darkrooms to control acetic acid vapors and other vapors and gases produced.
- ?? Exhaust darkroom air to the outside and do not recirculate this air to any other areas of the building.
- ?? Supply an adequate amount of make-up air. This make-up air should be 90% of the air that is exhausted, in order to maintain negative pressure in the darkroom.
- ?? One major supplier of developer chemicals recommends supplying 10-20 air changes per hour for workrooms and using local exhaust ventilation for processing and mixing tanks.
- ?? Use slot exhaust hoods for mixing tanks.
- ?? Only trained staff should mix photoprocessing powders and concentrated solutions.
- ?? Powders should be mixed under a local exhaust system.
- ?? Use local exhaust ventilation for color processing.
- ?? Wear protective equipment such as goggles, aprons, and gloves during black/white and color processing.
- ?? Provide an emergency eyewash station in or near the darkroom.

For more information on this subject, obtain the PEOSH information bulletin on **Emergency Eye Washes and Showers**.

8. Art Rooms - Kilns

Kiln emissions are a result of the heating of clay and glaze chemicals. Kiln emissions can include: sulfur dioxide, lead, cadmium, carbon monoxide, chlorine, fluorine, nitrogen dioxide and ozone.

Some possible health effects include lung irritation from the sulfur oxides which can form sulfurous and sulfuric acid mist or droplets, and lung irritation from chlorine gases, nitrogen oxides, and ozone.

What can be done to reduce potential health hazards?

- ?? Equip kilns with a local exhaust system such as a canopy hood.
- ?? Design the local exhaust system with duct work and a fan which directly captures kiln emissions at the source and removes them to the outside.
- ?? Provide a capture velocity of 100 feet per minute.
- ?? Provide side curtains on the hood to increase the efficiency of the canopy hood by decreasing the effects of cross-drafts.
- ?? The hood should cover the contaminant source without interfering with the work process.
- ?? Provide headroom between the source of contamination and the hood to allow one to open the kiln door after it has cooled down.
- ?? Provide adequate make-up air to replace the exhausted air.
- ?? Do not use dilution ventilation to remove kiln emissions from art rooms.
- ?? Do not use lead-containing glazes.

9. Art Rooms - Sculpturing

There is evidence to suggest that overexposure to possible components of clay dust such as silica, asbestos, and talc can cause silicosis (from silica and talc), cancer (from asbestos), and other respiratory abnormalities. Dry powder clays that must be mixed at school should not be used. Only wet prepared clay should be purchased in order to keep airborne dust to a minimum.

Exposure to clay dust can be reduced by implementing a routine housekeeping program. The program should include damp mopping the floor at the end of the day where clay products are handled and damp wiping all work surfaces after each class period.

10. Art Rooms - Silk Screen Printing

Silk screening products and solvents may contain highly toxic compounds that have the potential for creating serious health problems if overexposure occurs.

Solvent-based silk screening should only be conducted using an explosion-proof local exhaust system at all stages of the process. The local exhaust system for solvent-based silk screening is very costly and still may not ensure that students will not be exposed to highly toxic substances. The best solution is to switch to water-based inks which reduce the hazardous solvent exposure. The inks and cleaning materials in the water-based

process contain little or no solvents. By substituting a water-based product, there is a significant reduction of airborne organic vapors, and solvent skin absorption can be eliminated. In addition, the risk of fire is greatly reduced. Adequate dilution ventilation must be provided.

11. For Further Information

The Environmental and Occupational Health Sciences Institute (EOSHI) in cooperation with the New Jersey Department of Education, Office of Adult and Occupational Education, has developed a training manual "Safe Schools: A Health and Safety Check." This manual contains checklists covering environmental, health and safety regulations for secondary occupational and career orientation programs. To obtain a copy of this manual write or call:

Resource Center of EOSHI
681 Frelinghuysen Road
PO Box 1179
Piscataway, NJ 08855-1179
(908) 932-0110

If you have any questions or need further guidance in order to implement any of these recommendations, please contact the Public Employees Occupational Safety and Health Program at (609) 984-1863 or write to the:

New Jersey Department of Health and Senior Services
PEOSH Program
PO Box 360
Trenton, NJ 08625-0360

This bulletin was prepared in part with materials provided by the Center for Occupational Hazards in New York City.



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Last Updated: October 8, 1997



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Safe at School

Resources for being safe at school from injuries sustained on the playground, sports injuries, and violence.



The Problem

Americans have always believed that schools should be safe havens for children. Although schools are safer than many other places in our communities, children still suffer injuries related to such things as falls, playground injuries, sports injuries, and from violence. There are many ways that these injuries can be prevented. This website is being developed for the public and community groups to provide access to information and resources provided by many organizations that work to prevent injuries. In the coming months we will post many more entries about ways to prevent injuries and ensure safety in schools.

Bus Safety

- ?? [School Bus Safety Rules](#)
National Safety Council
- ?? [School Buses](#)
National Highway Traffic Safety Administration
- ?? [Get To School Safely!](#)
U.S. Department of Education

Playground Safety

- ?? [Drawstrings Can Catch and Kill Children](#)
Consumer Product Safety Commission
- ?? [Handbook for Public Playground Safety](#)
Consumer Product Safety Commission
- ?? [Playground Safety](#)
SafeUSA
- ?? [Back to School Safety Checklist](#)
Consumer Product Safety Commission

