CLASSROOM ECOSYSTEMS

Is Educational Technology Safe?

As schools rush to create instructional settings to meet the increasing demands of this technological age, focus centers on the electronic equipment and overlooks the classroom as an *ecosystem*. Students are spending increasingly more time in sophisticated environments inhabited by computers, video display terminals, keyboards, and printers. Because many parents work in nonacademic surroundings, they are aware of regulations, such as promulgated by the Occupational Safety and Health Administration (OSHA), that address their work environment health and safety. Knowledge of health hazards in the workplace is leading school district personnel and concerned parents to raise questions regarding their children's welfare in the classroom environment.

Are these learning situations truly safe? Does the emission of radiation from the Video Display Terminals (VDTs) pose a health risk to children's still-developing bodies? Do children experience the same visual problems, such as eyestrain, fatigue or irritation, as adults in the workplace? Are the musculoskeletal and nerve disorders, such as carpal tunnel syndrome (CTS), tendonitis, and tenosynovitis accruing in as many victims in schools as in business? If the answers are yes, how can children be protected?

"Even though more technology infiltrates the public schools daily, few students have a personal computer at their desk eight hours a day as a worker in the business world does. In elementary schools, the majority of computers are located in a centralized location, such as the library or a lab, that children visit regularly to complete specialized assignments" (Simonson, 1994, p. 134). However, with the advent of telecommunication capabilities and Internet, more school districts are furnishing individual classrooms with computer terminals that remain operational throughout the class day. With students' easy access to the computer stations coupled with their fascination of desktop publishing software packages, e-mail features, and games, it is logical to extrapolate workplace health hazards to the educational milieu.

Secondary schools have revitalized their curriculum with computer-assisted instruction in word processing, drafting and design, and computer programming classes. With the new class scheduling time frames, older students can spend two hours at a computer in one class before moving to another class to complete another two hour activity there. This exposure to electronic learning is long enough to cause physical discomfort for some students.

Because the publication of interactive multimedia and hypermedia is increasing, dedicated teachers are seeking to support curriculum demands. For example, Texas was the first state to adopt a software application, Windows for Science, as a science basal text. Wisdom, therefore, suggests that educators acquaint themselves with ergonomic knowledge to anticipate problems and initiate countermeasures before the electronic educational ecosystem causes harm for students.

Although the immediate resources to evolutionize classrooms into safe ergonomic environments may seem costly at first, the benefits will prove to be of greater value. If this expenditure is ignored, schools may expect the same health complaints that information workers report from the business arena—eye strain, headaches, carpal tunnel syndrome, back and neck aches, dermatitis, and nausea (Franchi, 1994).

LITTLE RESEARCH AVAILABLE

A search of current literature in the field of educational technology shows no report of any school system, college, university, or state department of education initiating a review of the classroom electronic ecosystem. Except for business and vocational classes in the upper grades, in which office atmospheres are duplicated with adjustable tables and chairs, most computers sit on cafeteria tables or rest in study carrels accompanied with cafeteria-type chairs. However, the similarities of the workplace and the classroom are evident. The time has arrived to apply knowledge gained from investigation and research in the business community to the education community.

Information from business and occupational health publications indicate a need for the discussion for emerging ergonomics application in educational technology issues. Ergonomics is the study of the workplace in its totality as an environment in which someone works (Walker, 1994). Ergonomics considerations include the physical attributes of temperature, lighting, . . . and the standing and seated work postures required to perform the work; the tools used to accomplish work tasks; communication requirements; . . . and the configuration of the work area. For example, the American Society of the Safety Engineers identified some school district needs and scheduled these sessions at the 1995 Orlando conference: how an innovative safety program can benefit a school district, the effects of electromagnetic field (EMF) effects on environmental safety and other electrical hazards; EMF radiation: approximate cause, liability and insurance issues, and indoor air quality compliance. This professional organization and others have resources to assist educators in addressing the potential health hazards in the classroom.

In response to the occurrence of health disorders resulting from neglected ergonomics in the workplace, the Occupational Safety and Health Administration (OSHA) responded by proposing standards to the Department of Labor (DOL) that address ergonomic hazards. The substance of these standards reflect four components from OSHA's "Safety and Health Program Management Guidelines": worksite analysis, hazard prevention and control, medical management; and employee training and education" (Thurman, 1994). Since industry has acknowledged the value of ergonomic intervention to address increasing task-related health concerns, educators should consider examining classrooms searching for situations that pose a potential health compromise for their students and teachers.

OSHA's recognition of workers' injuries sustained in electronic environments acknowledge exposure to electromagnetic fields, repetitive stress injury (RSI), visual strain, and musculoskeletal disorders as genuine concerns. RSI injuries include carpal tunnel syndrome and various tendon disorders that are caused or aggravated by repetitive motions, forceful exertions, continuous vibrations, or sustained or awkward positioning of the hand, wrist, arm, back, neck, shoulder, and leg over extended periods. In addition, the musculoskeletal and nervous system in upper or lower extremities and the back area are at risk (Olsen, 1995).

Protecting teachers and students who work daily in electronic environments demands that educators supervise a "worksite analysis" of such instructional situations. Scrutinizing the technological installations on each campus to diagnose any potential health compromise to students or teachers would, indeed, be challenging.

EMF RADIATION

At the center of the health controversy are the effects of electromagnetic field (EMF) radiation on humans. Evidence continues to mount linking the very-low-frequency (10kHz to 300Hz) and the extremely-low-frequency (ELF) radiation emission (below 300Hz) from video display terminals (VDTs) to adverse biological change (Branscum, 1994). Even though recent studies have linked VDT radiation to infertility, miscarriages, and birth defects, critics still question whether such health effects are solely the direct result of VDT use. Also, some of the studies have suggested that an association between exposure and cancer might exist.

Because the studies cannot exclusively prove that there is cancer risk from ELF radiation, the U.S. Food and Drug Administration believes that current scientific data is not sufficient to warrant regulatory action (Health Responsibility Systems, 1993). "To date, there is no conclusive evidence that low levels of radiation emitted from video display terminals (VDTs) pose a health risk to operators" (Stafford, 1992). Within the last five years in the absence of scientifically established standards, most monitor manufacturers support the Swedish Guidelines, known as MPR-II set forth in 1990 by the Swedish Board for Measurement and Testing (Branscum, 1994).

However, some workplace designs have incorporated precautionary measures to protect operators, such as increasing the distance both between the operator and the terminal and between the work stations themselves to reduce potential exposures to electromagnetic fields (Martin, 1991). Other suggested methods of protection from electromagnetic emissions include turning monitors off when they are not in use (Stafford, 1992), and using an MPR II-certified low frequency monitor, and using a laptop or personal computer with liquid-crystal-display screen (Brenner, 1993). Others advise that employees avoid sitting within five feet of any computer's back and sides where radiation is also emitted (Branscum, 1994; Matthes, 1992).

RECYCLING COMPUTERS

School districts have a unique habit of recycling computers for cost effectiveness. High school vocational and programming classes receive first priority for the latest models to prepare its graduates for either college or the workplace. Because selling older versions of technological hardware is difficult, it is a general practice to send these machines to the lower grades. Since monitors older than five years are not within the latest manufacturers' guidelines, researchers recommend that the emissions should be checked by a qualified examiner or safety engineer (Roth, 1994).

In order to correlate the results of OSHA's studies in the workplace to classroom safety, those equipped with educational technology must be compared with business workplaces. Instead of an eight-hour day at a video display terminal that a telemarketer, secretary, accountant, or engineer might have, secondary school students have two hour sessions in vocational, remedial word-processing labs, or computer-assisted drawing classes; elementary students' instructional session in a computer environment may average forty-five minutes to an hour.

VDT RISKS

Workplace studies show that concern arises with the activities of VDT workers after two hours. When relating the results of these studies to the educational world, several questions arise. In school situations, how many hours of EMF exposure do students receive daily from VDTs in all classes? As they progress yearly from grade level to grade level, does this sustaining exposure have a cumulative effect? No reports of research considering these questions could be found.

Little thought has been given to the EMF emissions steadily emitted from the VDTs' screens, backs and sides, printers, and copy machines upon the health of teachers, aides, and office personnel. Many spend eight hours managing classrooms that house integrated learning systems, or telecommunications equipment.

As teachers move about the room assisting students with assignments, how much EMF exposure do they receive? Some teachers leave computers active the entire day to preserve hardware. Screen savers have been installed on most machines to save the cathode tube from having images burned into the screen; however, the monitor continues to emit EMFs from the back and sides.

As the science community continues their debate about the potential EMF dangers, teachers and students can take precautionary measures. In the classroom, positioning the monitor about 28 to 30 inches from the user is an excellent beginning. If objects on the screen become difficult to view, the size of the objects or fonts while creating projects can be enlarged. Visits to an optometrist to secure a prescription to use during computer-related activities will help. Finally, turning the monitor off when it is not in use protects everyone (Roth, 1994).

Translating this information into the classroom suggests that arranging the furniture in a computer laboratory so that computers are positioned back-to-back would be helpful. This layout protects students who are sitting at a VDT from the emissions generated from the rear portion of a second monitor. Printers stationed away from the VDTs against a wall or behind a portable room divider would not only eliminate excess noise, and may also decrease the amount of EMF emission exposure, provided that no workstation was located within five feet of the printer placement.

PREGNANT STUDENTS

Pregnant students should be educated about the facts and myths of EMF effects on spontaneous abortion. Evidence linking computer-related miscarriage is far from being conclusive. Wearing lead aprons will not stop EMF emissions and the extra weight may damage the fetus. Because water retention is a problem during pregnancy, taking short breaks every twenty minutes to stretch and move will ease the fluid buildup in the legs and feet (Roth, 1994).

Females in the last trimester of pregnancy appear to be disposed to developing carpal tunnel syndrome (CTS). Gravity forces excess fluid into the extremities and circulation lessens. Fluid accumulating in the wrists, hands, and fingers can compress the median nerve, resulting in CTS (Dagostino, 1985). Pregnant students should receive special instructions concerning good posture practices when working and methods to adjust the chair and desk at the workstation. Such training will not only help relieve physical discomforts, but help prevent any injuries.

GLARE SHIELDS

Some companies market computer glare shields claiming or implying that screens can block the electromagnetic emissions. Research shows that these devices may be able to block much of the electric fields generated by the monitors, but they do *not* block the magnetic fields upon which the health concerns are centered. MacWorld Lab has tested

NoRad's ELF Protect which is a set of special metal bands that fit around the top and sides of a monitor. It works by deflecting magnetic fields from the monitor to the bands. The Lab also investigated Get Safe's E.L.F. Armor, a steel-alloy tube that fits around the yoke of the display's cathode-ray tube. It did significantly reduce magnetic-field emissions (Branscum, 1994).

VISUAL STRESS

In a recent nationwide poll, eyestrain caused by video display terminals topped workers list of job-related health complaints. A survey revealed that optometrists are treating more than 8 million VDT-related eyestrain cases per year. Symptoms of visual stress include headaches, irritated or reddened eyes, double vision, blurred vision beyond close range, eye irritability, changes in color perception, and difficulty when trying to concentrate on a task (Stafford, 1992).

Sheedy (1993) surveyed optometrists in the Journal of Hospital Occupational Health. Fifty-five percent of the responses said that their VDT patients had symptoms that are different from other near point workers, especially as related to glare, lighting, unique viewing conditions, and spectacle requirements. A greater frequency and severity occurs in the nature of the visual deficiencies such as uncorrected refractive errors, accommodative disorders, irritated eyes, binocular disorders and spectacle design problems. Recommendations from the survey to resolve symptoms for VDT workers were providing regular vision examination, special VDT prescription or spectacle design, and treatment in conjunction with diagnosis and vision environmental problems.

Roderick and Jelley (1991) recently designed a study to determine the perceptions of secretarial and clerical staff at Southwest Texas State University in San Marcos, Texas, concerning the possible health hazards associated with video display terminals and record any health disorders workers had experienced. Results showed that the VDT operators complained about health problems at least twice as often as other office workers who do not use VDTs.

Only 37% of the VDT users reported purchasing glasses or special prescription eyeware for VDT work. Less than half reported having anti-glare screens devices for their monitor. Not wearing glasses or special prescriptions could account for eye discomfort, therefore the researchers recommended that VDT workers who spend more than three hours a day in front of a screen should have an annual eye exam (Roderick, 1991).

In OSHA's draft of ergonomics standards, currently under review by the U.S. Department of Labor, employees working at video display units more than four hours a day and reporting problems will be reimbursed for eye exams and lenses different from their regular glasses (Olsen, 1995). The federal government's acknowledgment of injury to workers' vision should alert educators' curiosity of the monitor's effects on children's vision.

Other common vision problems were eye focusing breakdown and eye coordination anomalies. Indirect signs of VDT-induced stress include neck or shoulder tension, back pain, excessive fatigue when using VDT, increasing irritability when using VDT, frequently losing place when reading materials, and general decline in productivity (Godnig, 1991).

Teachers working in technological environments can identify these problems by student observation. Students will often rub their necks or eyes. Body language and facial expressions are also indicative of physical distress.

EASING VISUAL STRESS

Visual stress may be eased by viewing the monitor in a neutral posture. The eyes should have a 15 to 20 degree downward gaze. The horizontal shift required to read printed material on the desks and then returning upward to the screen causes neck and shoulder strain from repetitive movement. The viewer also is susceptible to visual interference from glare, distracting background, variations in the room lighting, etc. In addition, the VDT has a flat two-dimensional surface and the ability to read characters on the screen depends on the contrast (Godnig, 1991).

The height of the display screen should be determined according to user's height and orientation to the task. The topmost line of the display should not be higher than the user's neutral eye position. The screen and document holder should be the same distance from the eye (to avoid constant changes in focus) and close enough together so the user is not moving the neck and back excessively (Martin, 1991).

Character appearance in digitized text can ease viewer's discomfort. Research shows that black characters on white backgrounds give users the most comfort, probably because it is the most familiar. Other popular colors include green, yellow, and orange. Multicolor displays are harder to read than the monochrome or one color display. This is most apparent with the colors at the end of the spectrum, particularly reds and violets (Godnig, 1991). Students with some form of colorblindness will see partial letters when they either read information or when they use word processor programs in writing activities. This condition may hamper student performance.

Screens that "flicker" and "swim" will frustrate viewers and indicate monitor problems. Flickering is the number of times the monitor repaints and swimming refers to the wave-like movement of the entire screen display. Some software has instructions that scroll onto the screen a line at a time or a page at a time. This also can stress the viewer's tracking skills.

MIGRAINES AND EPILEPTIC SEIZURES

Since headaches most often originate with eyestrain, students suffering from migraines should be informed that certain characteristics of monitor viewing can play a role in triggering a headache. If this occurs, they should be advised to see a physician.

Antiglare screens, dark glasses, and simply adjusting the brightness and color of the monitor may help. In addition, migraine sufferers might consider limiting their intake of caffeine contained in substances such as soft drinks, chocolate, and coffee. In addition, small numbers of children have reportedly experienced epileptic seizures while playing video games. Little research has addressed this complaint.

However, it is known that flashing lights or flickering images can cause seizures in children who are photosensitive. Parents of children with epilepsy should be given this information so that they may consult the family physician about this matter (Roth, 1994).

The National Institute of Occupational Safety and Health (NIOSH) recommends taking a 15–minute break every hour from high demanding computer tasks (Health Responsibility Systems, 1993b). Teaching students safe computing practices with simple eye exercises, such as blinking frequently to reduce dryness and irritation, focusing on an object at a distance, and closing the eyes for a brief moment will help ease discomforts. In addition, a doctor may suggest more specific training activities that could be of greater benefit for maximum improvement of individual visual abilities (Godnig, 1991). Also, contact lens wearers may experience “dry-eye” from infrequent blinking. Because contacts are designed to focus at 20 feet, they might not be appropriate for close work (Roth, 1994).

LIGHTING IN THE CLASSROOM

Steelcase, a Grand Rapids-based office furniture manufacturer surveyed more than 6,000 office workers worldwide. They found that although 92 percent of the U.S. office workplace rated proper lighting as very important in their workplace, only 64 percent reported that they had such lighting (Matthes, 1992).

Improper lighting conditions in the workplace, such as too much daylight, glare from fluorescent lights or not enough light, cause workers to have headaches, fatigue, eyestrain, sore neck, and back muscles. Methods to control direct glare include controlling sunlight conditions with blinds or drapes; installing recessed lighting fixtures or baffles over fluorescent light; providing screen hoods for terminals, or repositioning terminals in respect to windows and overhead lighting (Roderick, 1991).

Windows in brightly lit rooms need drapes or blinds. Students should not sit facing a bright window. If necessary, screen hoods or glare shields can be used over the screens (Health Responsibility Systems, 1993b). Two types of filters are available: natural density filters, which scatter and diffuse light reflected from the screen; and micromesh filters, which not only scatter the light but also absorb most of the light reflected from the surface of the screen by means of an imbedded interwoven grid of dyed nylon fibers. Newer monitors tend to have antiglare matte finishes (Martin, 1991).

Display screens should be at right angles to all light sources. Limiting the reflection from walls and work surfaces visible around the screen may be accomplished by painting the tops of work stations with medium colors or installing a nonflective finish (Martin, 1991). A dimly lit room environment is often best when using VDTs; however, this creates difficulty when tasks include using both electronic and printed text.

RSIs

The Bureau Labor of Statistics reported that repetitive stress injuries (RSIs), such as carpal tunnel syndrome (CTS) , which is an inflammation of the tendons in the wrist, is rapidly becoming the fastest growing occupational illness. In 1982, RSIs accounted for 21 percent of all occupational injuries—agricultural, industrial and office; in 1990 they increased to 56 percent. By 2000, OSHA estimates that half of money spent in medical costs will cover RSIs unless ergonomic concerns are addressed (Matthes, 1992). CTS, or Carpal Tunnel Disorder (CTD), is the most common repetitive strain injury, among computer users. It starts with a slight tingling in the index finger and increases in the degree of pain as it advances toward the neck (Campbell, 1994).

The National Institute for Occupational Safety and Health (NIOSH) continues to investigate the debate concerning whether or not using computer keyboards is hazardous. In a 1989 survey of 834 Newsday employees, 40 percent reported symptoms consistent with CTDs. Because ergonomics stress the importance of natural positioning, it focuses on the avoidance of unnecessary stresses on the body through a carefully designed workplace. Motion-study literature categorizes the natural movements of the body into five areas in order of priority: fingers; fingers and wrist; fingers, wrist and forearm; fingers, wrist, forearm and upper arm; and fingers, wrist, forearm, upper arm and shoulder (Kaimann, 1993). There has not been enough research into the physiological effects of prolonged mouse and trackball use. It has been suggested that the mouse is an ergonomic advance because it relies on the stronger muscles of the shoulder and arm, but many users swear that it was their mouse that gave them carpal tunnel syndrome (Roth, 1994).

Several types of ergonomically designed keyboards have appeared in the marketplace claiming to reduce fatigue and stress by integrating human factors engineering and motion study principles into their design. One new ergonomically designed keyboard addresses wrist rotation and hand deviation from a neutral position. The keyboard includes detachable palm rests, a split alphanumeric keyboard for adjusting the left and right hand sections to 30 degree angles and feet for adjusting the key slope. The separate numeric keypad has function keys and its own palm rest (Green, 1993). The desired benefits of the new designs include reduced finger travel through utilizing a revised key layout and creation of a more natural posture and movement pattern for the keying environment (Kaimann, 1993). Product documentation carefully explains that keyboards do not prevent CTS. Such a disclaimer protects the company from potential medical liability.

In addition, those working in an electronically controlled environment who perform repetitive motions or patterns or those working in positions sustained for more than two hours should be carefully monitored by employers for risk factors.

It cannot be assumed that all persons who keyboard are expert typists. Two fingered typists, hunt-and-peck techniques and awkward finger combinations are common. In many cases, these personal characteristics have been identified as substantial contributors to injury (Guinter, 1995). In the classroom, small children would also fall into this category. In spite of the down-sized keyboards designed to fit tiny hands, typing technique might be a problem to developing young bodies.

There is insufficient research into the physiological effects of prolonged mouse and trackball use. If gripped too tightly or incorrectly , these pointing devices can cause injury. Ergonomic experts recommend that users select a mouse which fits the cupped hand comfortably. Switching to a trackball also requires careful selection. How resistant the ball is to the user's movement is the prime consideration. If it moves too easily, then the user must work harder to control it; if it moves stiffly, more strain is applied to the small muscles in the fingers to force action (Tessler, 1994). Individualization of computer equipment in the school situation may be a financial challenge; however, all expertise from literature in the field addressing RSIs must be noted.

Other products to protect workers are on the market. Some stress-reducing software allow the user to use the numeric keypad as a mouse and allow menus to be displayed until an item is selected. This reduces wrist motion (Tessler, 1994).

Wristpads installed at workstations allow the operator to keep arms in a relaxed position with the forearms at a 90 degree angle to the body (Kerr, 1993). However, users cannot brace their wrist on the pads while typing or the added wrist pressure will actually increase the risk of CTS (Tessler, 1994). Chairs with arm rests tailored for the workplace can assure comfort, reduce strain, and promote good posture (Lesin, 1994). Computers equipped with speech recognition also free the user from keyboard hazards. This input device capability is helpful to those who are physically disabled, who cannot type, or who fear computers (Stevens, 1993).

Research has also shown that obesity and poor physical fitness are possible factors in CTS predisposition. The National Institutes of Health (NIH) define obesity as exceeding one's body weight by 20 percent or more. Obesity slows down transmission along the sensory portion of the nerve that passes through the carpal tunnel in the wrist. This causes muscle tendon irritation and inflammation (Dagostino, 1985).

The simplest measure to prevent or reduce cumulative trauma through repetitive work habits is to schedule frequent breaks (Lesin, 1994). Gentle typing movements or keeping arms and fingers warm with fingerless gloves can help reduce risk.

WORKSITE FURNITURE

Ergonomics places special emphasis on neutral postures and body symmetry. These ideals can be lost with the improper placement of computer hardware. Awkward postures needed for viewing video monitors that are too high or located to the side can cause upper body injuries. Hand and arm injuries may result when keyboards cause deviated wrist positions while typing. Positions that require hyperextension (upward bending) or ulnar deviation (outward bending) are possible hazards (Guinter, 1995).

Because employees come in different shapes and sizes, companies should invest in flexible, articulating furniture so that individual needs can be accommodated. Employees would then have the opportunity to customize their workstations to suit their unique dimensions and working preferences and worker safety education programs (Benoit, 1992). Safety education programs emphasizing adjustable furniture and desks inform workers of measures to prevent health problems. According to a Canadian study, only 5 percent of adjustable furniture was adjusted during the workday by employees and only 12 percent knew that the furniture could be adjusted (Matthes, 1992).

Chairs which accompany work stations should be flexible and adjustable. The chair height from the floor to the point at the crease behind the knee is correct when the entire sole of the foot can rest on the floor or footrest and the back of the knee is slightly higher than the seat of the chair. The seatpan can be concave with a rounded or waterfall edge. A proper backrest should support the lower region of the back (Martin, 1991) and high enough to support the shoulder legion. Armrests should be high enough to support the forearms, but not so high that the worker must raise the shoulders to reach the keyboard. They should also be directly under the arms and not bump against the work surface (Tessler, 1994).

Equipment surrounding the chair should be within 15 inches of the hands that use it. The desk or keyboard tray should leave enough clearance for the thighs but not be so high that wrists bend upwards or cause the forearms to be raised. Optimally, wrists should be kept neutral. If the keyboard tray is flexible, taller people may find a reverse tilt more comfortable. Use of a copy stand located at one side of the monitor may lessen neck and back tension (Tessler, 1994).

Since adults come in all shapes and sizes, it is important for employers to consider investing in articulating furniture so workers can customize their workstations in order to increase productivity (Benoit, 1992). If this concept of utilizing flexible furniture increases worker comfort in business, it is logical to extrapolate the same concept to the classroom.

SICK BUILDING SYNDROME (SBS)

When schools began creating computer labs to serve student populations, maintenance crews often received renovation job orders instructing them to rewire rooms with extra outlets and seal off outside windows. However, this quick-fix to remodel older structures into technological beehives might have created an additional problem. Sealing the windows to protect the electronic environment can create Sick Building Syndrome (SBS). Efforts to increase energy efficiency can inhibit air circulation and cause poor ventilation resulting in an accumulation of interior pollutants (Matthes, 1992).

The invisible climate surrounding computers consists of heat from various components and a circulation of gases and particles near the monitor. Workers sometimes complain of facial dermatitis, red and sore eyes, nausea, stress, and fatigue. It is a common belief that computer screens attract negatively charged particles and vastly reduce the number of negative ions in the air.

Ways to combat SBS include increasing humidity in the air if the computers can tolerate it; redirecting the airflow from the computer and printers' cooling fans away from the workers; dusting and vacuuming inside the work area as well as inside the computer; treating any carpeted areas to decrease static electricity, and installing a negative ion generator (Roth, 1994).

CONCLUSION

Ergonomic information from the workplace has proven that there are health risks to those who work in an electronic environment. It is evident from the absence of research from educational sources that knowledge from one field has not been transferred to another. This would indicate that empirical research projects should be initiated to determine if there are health risks in the academic setting to teachers and students.

Teacher inservice sessions and parent education through local PTAs would alert the public to facts (not the myths) surrounding educational technology in the classroom. Institution of research projects would reflect responsibility exemplified by school personnel. In addition, school districts should point out that children face health risks caused by electronic emissions in recreational areas and at home by close proximity to such electrical appliances as televisions, microwaves, electrical blankets, heaters, or cellular phones. Because most parents are concerned with the prospect of their children becoming "computer potatoes", they want to have the information to begin home health interventions. They want to know that their children's headaches might be due to the need for special glasses to wear when using the computer.

Learning about effective technology ergonomic interventions would be useful in homes where there are computer stations. Health information given to parents about posture and positioning of workstation furniture would enable informed purchases and/or configuration of their computer environment.

There is also a spectrum of healthy software commercially available that features exercise programs, advice on workstation setup, posture, and eye aerobics. Some of these offer exercises which are triggered at timed intervals during the day or after keyboarding ceases for 10 seconds (Roth, 1994).

Even though many homes cannot afford computers, parents want to know what is happening in their children's lives. They worry about controversial topics that news media use to sell newspapers or magazines, and attract viewing or listening audiences. Factual knowledge is the best gift school personnel can supply to nurture the health of children. With the increasing occurrence of disorders resulting from neglected ergonomics in the workplace, OSHA has responded by proposing standards that address ergonomic hazards. The substance of these standards reflect four components from OSHA's "Safety and Health Program Management Guidelines": 1) worksite analysis, 2) hazard prevention and control, 3) medical management, and 4) employee training and education" (Thurman, p. 18, 1994). Industry has acknowledged the value of ergonomic intervention to address increasing task-related health concerns. Are educators now ready to do the same for their students?

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