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Introducing Ergonomics in Two US Elementary Schools

C. Bennett, and D. Tien

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INTRODUCING ERGONOMICS IN TWO US ELEMENTARY SCHOOLS

Cheryl Bennett1 and Diane Tien2
Lawrence Livermore National Laboratory1, Blackwell Elementary School2
bennett13@llnl.gov

The increasing presence of computers and other forms of information and communications technology (ICT) in schools has raised concerns in the United States (US) and elsewhere. Children are using computers more than any other age group in the US. It is not known whether early intensive use of ICT predisposes children to future injury. Ergonomics is not included in state curriculum standards or requirements but can be supported by some of the existing standards. Some who believe that children are better off being educated early about ergonomics are taking action to bring ergonomics into elementary and secondary schools. This paper describes the process used to introduce ergonomics into two elementary schools in two different states by initiators with two different roles.

INTRODUCTION

Computers are a part of the lives of children in the United States (US). By fall of 2001, 99 percent of public schools in the US not only had computers but also had access to the Internet and the ratio of students to computer with Internet Access was 5.4 (Kleiner and Farris, 2002). When school and home use are combined 90 percent of children between the ages of 5 and 17 use computers. Children and teenagers use computers and the internet more than any other age group in the US (USNTIA, 2002).

Intensive computer use has proven to increase the risk of musculoskeletal disorders in adults. The vast majority of ergonomic awareness education provided in the US has been by employers for their employees. If employees come to them with pre-existing musculoskeletal disorders acquired during their educational experience who will be responsible? What role shall schools take for ensuring children grasp basic ergonomics principles before they enter the job market? An analysis of the US legal system led one researcher to conclude that the Individuals with Disabilities Education Act (IDEA) may require schools to accommodate the special needs of children with musculoskeletal disorders (Bradley, 2001).

A positive indication for the future is Assembly Bill 545 passed in March 2003 by the State of New Jersey to study the issues related to ergonomics in schools and to determine the "need, viability and cost" of promoting safe computer practices in the classroom (Hainsworth, 2002). California has also passed legislation requiring the State to adopt maximum weight standards for elementary and secondary school textbooks by July 1, 2004.

As there are currently no standards or regulations requiring ergonomics in schools, most efforts to introduce the concept in schools have been on a volunteer basis. Many of these volunteers have been parents with backgrounds in ergonomics or have obtained assistance from ergonomists (McGrane, 2001). This paper will describe two elementary schools in two different states (Washington State and California) where individuals have made efforts to incorporate ergonomics. In Washington a Technology Instructor who works within the school coordinates the implementation of an integrated program. In California a parent volunteer led efforts to introduce ergonomics.

BACKGROUND

Education in the US is managed at the state level rather than national level. The US Department of Education leaves the creation of schools, curriculum and most funding responsibilities to the states. In the US, the term K-12 refers to all primary, and secondary education from kindergarten through high school. Although K-12 curriculum standards are typically created at the state and district levels, the United States Congress can and has set learning goals and objectives for the country. With the current administration, federal funding is directly linked to performance tests.

Ergonomics in the curriculum

"Ergonomics" is not found in the standards or curriculum for public education in any state in the US. However, there are standards that can be used to support the inclusion of ergonomics. For example, in the Lake Washington school district in Washington State, teachers use a curriculum framework that includes relevant references supportive of ergonomic education. As early as K-2, topics of study in the Physical Education (PE) framework introduce fitness components of muscular strength/ flexibility/endurance, the concept of physical differences (from their peers) and safe handling of tools/equipment. The PE framework has similar supportive language for older students as well. A Library ergonomics program was created using the research framework combined with required technology critical content.

In California it is more difficult to find standards that support the introduction of ergonomics. For example, posture is not a component that is required. However, some of the science and technology standards could be used for developing an ergonomics curriculum.

School settings

Blackwell Elementary is part of the second largest district in Washington State, US. The district receives 72% of its funds from the state, 3% from the federal government and the rest from resources such as tax Levies and other investments (Lake Washington School District Website www.lkwash.wednet.edu). The school is located in an affluent suburb populated by high technology workers from Microsoft, ATT Wireless and many others.

The Californian elementary school is in a moderate socioeconomic area in Northern California. Despite the proximity to research and development laboratories, the district is categorized as a low-wealth district and receives less per student than the state average. The California elementary school is structured with multiage classrooms whereby two grades are in one classroom. The groupings are kindergarten-first (K-1), 2-3, and 4-5 and children may enter kindergarten from ages 4-6.

WASHINGTON SCHOOL

Initiating the program

The technology instructor began by contacting numerous educators and ergonomists. A professor at Cornell University agreed to allow a student to work as an intern with the technology instructor on a newsletter for the parent community. The state Department of Labor Safety and Health Assessment and Research for Prevention (SHARP) Program was consulted and reviewed written materials for technical content. The technology instructor approached the physical education (PE) teacher and library media specialist with the idea. These three educators would move the program forward to include music, art and many classroom teachers in a two-week focused program with continuing efforts through out the year.

Identifying what to teach

Biomechanics and anatomy. The PE teacher focused on biomechanics and relevant muscle groups. The goal was to create two class sessions introducing the students to the physical side of information and communications technology (ICT) and giving all students a 'work out' using their technology muscles. The hand, wrist, shoulder, back, spine and neck became the first areas of focus.

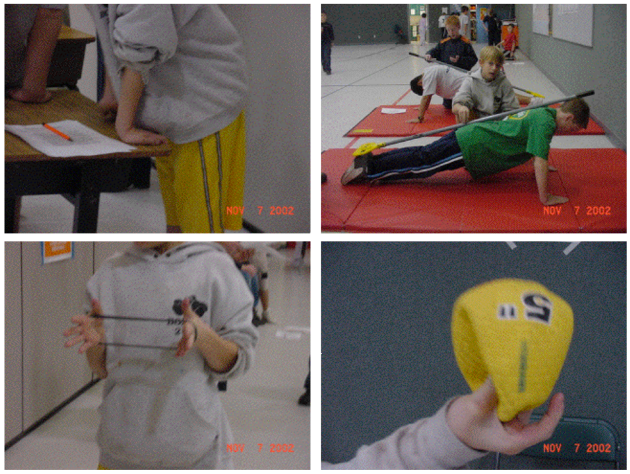

Figure 1. Examples of physical education class exercises

Context, definitions and relevance. The library media specialist uses a variety of materials to introduce the concept of ergonomics. The younger students hear a story of an ergonomically challenged worm and are introduced to simple stretches. Older students are encouraged to understand what muscles are used in various activities. Grades 5 and 6 students are expected to research various terms and answer directed questions related to ergonomics and ICT. Teachers meet existing media and literacy standards through different ergonomics projects. In the music sessions, all 600 students are refocused on the core ergonomic principles in relation to musical performance. Topics include posture and the difference it may make in sound

production quality and performer comfort.

Student and teacher involvement in the process

Students are given opportunities to evaluate the ergonomic effectiveness of their learning space, their peers and in some cases, a younger student. In a classroom with their regular teacher, fifth grade students working in partners use a simplified ergonomic assessment checklist to measure, evaluate and improve their learning space. The use of tape measures and goniometers supports the existing curriculum standards for mathematics offering a interdisciplinary approach.

Students are asked to evaluater their computer seating at home. Specific exercises and lessons that are given to specialists and teachers further reinforce the healthy ergonomic concepts during the two week Ergonomics Program. In addition, teachers receive an ergonomic assessment of their own workspace by a district representative.

Community outreach

The technology instructor brings in speakers from the community. A newsletter is produced for the parent community describing the program and offering suggestions for home ergonomics.

Extending program to other schools

Training sessions were held for 24 Physical Education Teachers on how to introduce this program into their school. A similar session was held with all the elementary school library media specialists.

CALIFORNIA SCHOOL

Initial contact

In the California elementary school, efforts to introduce ergonomics were initiated by an ergonomist parent volunteer. Details of some of the projects are described elsewhere (Bennett, 2002). The emphasis here will be a comparison of the process necessitated by the initiator being a parent volunteer. Over a four-year period, a variety of activities were proposed and a number accepted by the three different principals who were in office during that time.

The support of the parent and teacher organization was crucial and supplies for some of the projects were funded through the organization. Articles on ergonomics related to children using computers, backpacks and accommodating children at home computer stations were published in a newsletter sent to the parents.

Initially, and with each change in principal a meeting was requested to provide a basis for obtaining support and approval for the projects. Through the auspices of supportive teachers, ergonomic principles were first introduced in some of the kindergarten-first grade classes. The parent volunteer was asked by one of the principals to make a presentation to the teachers during a special meeting time. It turned out that none of the teachers attended and later it was explained that the teachers feel the demands on their time are such that they do not attend any meetings or training sessions that are not mandated. In following years a presentation was made to the teachers and staff during a regularly scheduled staff meeting which all of the teachers are required to attend. Ergonomics principles were introduced and information presented was related both to the students and the teachers.

Physical changes

The computer table heights in all the classrooms were measured and an optimum height for each of the three multiage group classrooms was determined. Authorization for additional maintenance support allocation with funding would have been necessary for the custodial staff to adjust the table heights and redistribute the chairs. Therefore the parent and teacher organization assisted in securing parent volunteers to adjust the table heights in all of the classrooms. The target table heights with recommendations for distribution of the three sizes of chairs among the classrooms were given to the principal and custodial staff. It was requested that during the summer, when the classrooms were cleared out and some classrooms changed to accommodate different grade levels, the tables and chairs be checked to ensure they remained adjusted.

The parent volunteer suggested that target computer table heights and chair distribution be addressed in the other schools throughout the district. A meeting with the district facilities personnel revealed however that they were willing to support the proposal if the parent and teacher organizations of each school contributed the labor necessary to initiate a change.

Ergonomics educational process

When the parent volunteer began working with the elementary school, the school technology instructor was supportive and enthusiastic about introducing ergonomics to the students. A brief instructional section on ergonomics was integrated into the computer presentation given to all students by the technology instructor; a diagram of an appropriate computer set-up was posted at all school computers (and was also sent home to parents); and an ergonomics section was included in the typing course given to older (grade 5) students. However turnover in the technology instructor could result in this element being lost.

During the fourth year the parent volunteer developed a four-week course that was presented to two groups of grade 3-5 students in four one-hour periods. Specialists such as an optometrist and a doctor of physical medicine (M.D.) participated in the presentations. The topics included basic ergonomics information, backpacks, computers, vision and typing technique.

DISCUSSION

There is a difference between the kinds of activities or program that can be implemented by a member of the school staff and the kinds of activities that a parent volunteer can carry out. A school technology instructor can be quite powerful in integrating ergonomics into the technology curriculum. As seen in the Blackwell school, a motivated and resourceful technology instructor can even create an extensive program that is integrated into the curriculum of many other subjects. Both approaches are believed to be better than the current standard, which is the absence of ergonomics in the elementary school curriculum. Both approaches also need to be institutionalized to survive the tenure of the initiator. The Blackwell program has begun to be broadened to other schools in the district and has the potential to become self-sustaining. The activities of a parent volunteer have less potential to become self-sustaining unless support from the district level broadens the implementation. Schools may be cautious about implementing ergonomics programs. Some ergonomists and parents approaching schools with offers to conduct studies or even volunteer in the area of ergonomics have been denied access. Administrators may believe that recognizing the need for ergonomics instruction or that any students are in discomfort may establish liability. Most are overwhelmed with the numerous subjects, performance standards and testing currently mandated.

Research needs

The need for research in the area of educational ergonomics is increasing with the burgeoning presence of ICT in and associated with schools. The ideal study would be a prospective randomized control study of students who have participated in an ergonomics program. The comparison of the health indicators of these students over time to a group of control students who have continued to use ICT throughout their education with no ergonomics instruction would be revealing.

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