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School facilities have largely been designed for limited technology; usually chalk boards and overhead projectors. New electronic, educational technologies require architects and school administrators to rethink school planning for the effective use of educational technology

Impact of Facilities on Technology Leadership

Kenneth E. Lane and Dwight P. Sweeney

The use of technology in the classroom has become a major educational consideration in both student learning and evaluation of leadership effectiveness. While there is a belief that the use of technology will improve the delivery of knowledge to students, questions regarding the impact of the facilities on technology continue. Why are physical facilities critical to providing technology leadership? What must technology leaders recognize and understand about facilities? What is the role of human factors engineering? Are technology-related infrastructure issues the same for all leaders in all situations?

Technology goes beyond having computers in the school. Technology implies that there is flexibility within the facility to conduct interactive communications for learning whether that be within the school, region, state, nation or world. It also implies that there is a willingness to incorporate new discoveries into both the curriculum and facility.

Physical Facilities and Technology Leadership

Technology within the classrooms of our schools is generally limited to the computer station. A few school districts have developed classrooms for the future by installing technology that permits the use of telecommunications for long distance learning. By long distance learning, we mean any learning situation in which the teacher and learners are physically separated from one another. Although self-directed lessons prepared for print, audiotape or videotape may be considered types of distance learning, the use of electronic technologies to connect the teacher at one site (the home site) with learners in one or more other sites (remote sites) are now considered the primary tools of distance learning (Tri-College University, ND).

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Classrooms tend not to have computer stations for each student. When there is a computer within the classroom, usually it is not a current model, not networked to the other computers in the school and does not have access to a phone line for accessing the outside world. Even computer labs within the facility endure these same problems.

Regretfully, school district finances play a major role in the use of technology. Schools are destined to use obsolete computers without adequate funds to continually replace them. Thus, efficiency lags as does the ability to use newly developed software which is directed to the new operating systems rather than the old systems.

These limitations begin to answer the question of why the physical facilities are critical to providing technology leadership. In reality, however, they do not address the question. They only defend the lack of instructional priorities and the lack of facility planning.

Technology leaders must begin to demand school facility retrofitting which will provide students with access to technology and technology services. Technology must be integrated into the school facility; it should not be a stand alone course to be taken by students. The school facility is an instructional tool first. It must be adaptable to facilitate new educational programs. There must be standards in place to help determine the benchmarks for the school facility (Stewart, 1989). If one of the benchmarks for the school facility is the integration of technology into the facility and the curriculum, then the planning of our schools facilities must enable us to accomplish this goal. Planning has to occur before the technology is implemented. The leadership in our schools has to recognize the message being sent to parents and the community. When facility planning does not occur, the message is that student learning is not important.

The school facility must physically allow for the appropriate use of technology in curriculum and assessment. The California Department of Education (1990) states:

> Using appropriate technology necessitates changes in how teachers teach and how students learn. Instead of being dispensers of knowledge, teachers will become facilitators of consultants. Teachers will benefit from technology by increasing their knowledge of a subject as they learn with their students. Perhaps the greatest advantage of technology is its potential for customizing teaching methods to fit the individual needs of students and allow them to study at their own pace.

If the technology leadership in our schools believe this, then the demand for retrofitting our school facilities to enable students to access technology will have to become the first priority.

Understanding the Impact of School Facilities

Making do with the present school facility is not acceptable. Simply placing computers on tables or desks is not an appropriate response. Students come in different heights with different eye sights. One common standard is insulting to the student learner. The use of technology ranges from computers at the student's desk to computers at the student's home which will interface with those at the school and at commercial computer online services. Regardless of the variation, the issue of how this interactive network will be incorporated into both the curriculum and the school's design must be addressed.

Maybe the answer is the accessing of classes from the student's home where accommodations tend to be more personal in nature and function. This demands a school which is a server for accessing information rather than a physical facility.

Brubaker (1989) discussed the impact of technology on the philosophy of our schools when he advocated the "community school" to enable residents to more frequently use school facilities and students to use facilities throughout the community. Schools leaders should promote the concept of the

"community school". Partnerships with government and business to use the technology in their facilities rather than duplicate them within our schools should be given serious consideration. However, some barriers to such partnerships need to be considered. McNeil (1990) defines the barriers and issues which impede usage of technologies:

1. *Technical barriers:* They cover the lack of standards and technological incompatibility. For distance learning, there are two inherent problems: providing the student with sufficient educational resources, and providing timely feedback from the teacher to the student.
2. *Structural barriers:* They include budgeting policies, lack of incentives, lack of training or technical support, poor support service, financial resources, access or disproportionate access, extra time it requires to use technology, and underutilization.
3. *Attitudinal barriers:* They focus on human aspects and various forms of faculty resistance to public exposure and off-campus learning, plus poor marketing conditions.

Perhaps it is time to revisit Hawkins & Overbaugh (1988) when in explaining the interface between the school facility and learning, they stated that "a school building must do more than simply house the instructional program. Perhaps instead the facility should be viewed as part of the program." The same is true for technology. It must be viewed not as an end in itself, but as a part of the program.

Human Factors Engineering

The impact of human factors engineering is a concept that must be understood by technology leaders. However, the professional literature and research in this area is minuscule (Robertson, 1992; Knirk, 1992; Hathaway, 1988; Taylor and Gousie, 1988). There is little information on human factors engineering as it relates to the school setting and student learning, especially in the area of student furniture for creating the best possible physical learning environment.

When Lane and Richardson (1993) contacted five major school furniture manufacturers in the United States, two questions were asked of each furniture representative. The first question was: What research does your company use to design furniture for schools to optimize student learning? In each instance, the response was that they did not rely on research but upon specifications from the American Furniture Manufacturers Association and the National Standards Board to decide seat width, belly room, and prohibited combustible materials. The second question was: How are design decisions made regarding school furniture? The predominant answer was that designs were basically unaltered for years and that designs reflected what schools want in furniture.

While there is a temptation to charge school furniture manufacturers with selling furniture without any research to validate design, that would be unfair. They simply manufacture what the customer wants. In this instance, the schools in this country keep ordering the same furniture that has been ordered for the last 25 years. There is also a temptation to blame the schools for this development. However, schools generally do not have the research budget or personnel to address furniture design change. Changes usually occur as a result of experiences schools have with students and teachers.

Clearly, for technology leaders, the issue of human factors engineering in the design of furniture for students needs immediate attention. The first step in this process is for school furniture manufacturers and technology leaders to begin a process of evaluating how education is going to be delivered in the future within both curricular and design boundaries. The tunnel vision of "lets buy what we always have because it works" and "lets keep manufacturing it this way because it sells" is fundamentally flawed because it does not address the most important question in education—what is in the best educational interest of the student?

The second step is to conduct research regarding the best furniture design to enable teachers to better teach and students to better learn. If the furniture we are placing in our schools does not accomplish that end, the effective use of technology to improve both the delivery and receipt of education is an unattainable dream.

The third step is to study the broader issue of human factors engineering as it relates to the total school environment. Furniture is a part of it but so also are lighting, colors, ergonomics, space, temperature, air quality, flooring and security. The question of how furniture harmonizes with those additional aspects should lead us into better methods of delivering a better educational system through the use of technology.

Infrastructure Issues

Technology leaders confront different physical situations as well as different student needs. For instance, physically disabled students have the same right to an appropriate physical learning environment as any other student. The *UFAS Accessibility Checklist* (1990) outlines many of the physical requirements that must be met by schools. As an example:

> Classrooms must have aisles at least 36 inches wide. Objects mounted to the wall inside a classroom must have bottom edges 27 to 80 inches above the floor and project no more than 4 inches into accessible space. The floors must be slip-resistant and have a level change of no more than ½ inch unless ramped. Signs identifying the rooms must be mounted on the wall at the latch side of the door between 54 and 66 inches above the floor. The characters must be raised 1/32 of an inch and be between ⅝ and 2 inches tall. Seating spaces for students in wheelchairs must have a 30 × 48 inch area of clear space. The knee space must be at least 27 inches high, 30 inches wide and 19 inches deep. The top of a work table must be between 28 and 34 inches from the floor. Additionally, electrical switches and receptacles and thermostatic controls must be between 15 and 54 inches above the floor on a parallel approach and 48 inches on a forward only approach.

Differences should also be recognized in terms of the age and the learning objective of the student. Elementary children have different technology needs than does the high school student. Likewise, a high school student analyzing data would need different software and hardware than an elementary student reading an interactive story on the computer.

The infrastructure must be evaluated in terms of its ability to be wired with optic fiber, to have cameras and microphones mounted within classrooms for distance learning and to house a local area network. The use of local cable company access and equipment within the facility must be addressed. While addressing these issues, the wiring and communications standards of the state and the building codes of the community require strict adherence.

Summary

Technology leadership requires an understanding of the impact of the facility on the use of technology, the role of human factors engineering in using technology effectively and the changes that must be made in the infrastructure to integrate technology into both the facility and the curriculum. The ability to integrate both an understanding and the application of technology into the facility is integral to technology leadership. It is only with effective leadership that our teachers can better teach and students can better learn.

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