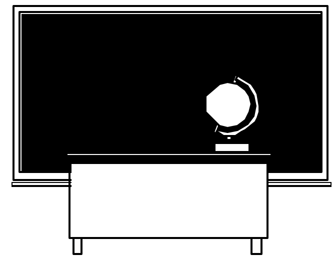
LISTENING FOR LEARNING 3:



COUNTING THE COSTS OF NOISY vs QUIET CLASSROOMS

Only 10% of a school system budget is expended on school facility design and construction. These are capital costs, one-time expenditures for a facility with a lifetime of thirty or more years during which time the school will serve thousands of students with a wide range of needs. The remaining 90% of the school system budget is allocated to programs -- staff, operations, and services costs that include special education programs and services, accommodations for individual students as they move through the system, even outside placements if accommodation is not feasible. These are substantial and annually recurring costs.

Let's look at a school of 20 classrooms, each 1000 square feet in size, serving 30 students each. Let's use a 20-year horizon to compare the costs of providing individual acoustical or other accommodations on an as-needed basis to individual students vs. building a new school that is acoustically accessible to all enrollees every year in every classroom to the costs: 'pay-me-now-or-pay-me-later' economics. Assumptions were developed from research data on disability prevalence, Department of Education statistics on public school services, and rule-of-thumb cost estimates:

1/Pay-as-you-go Scenario:

☑ *One child/year will require outside placement because existing construction can't be adequately remediated to serve his/her acoustical needs [1kidx$15,000x20yrs= $300,000]*

☑ *One child/year will require alterations to an existing classroom to improve acoustical conditions for learning [1kidx$10,000x20yrs=$200,000]*

☑ *One child per classroom will require out-of-class/in-school support services that could be avoided if classroom acoustics were adequate for good communication [1kidx$2,500x20classroomsx20yrs=$1,000,000]*

Estimated school program expenditures (20 year total):	***$1,500,000***
Number of children benefited:	***6,710***
Cost per child served:	***$ 224***

The scenario above is vastly simplified; multipliers have been somewhat adjusted to reflect the effects of increasing accessibility as classrooms are 'improved' over time, but inflation and opportunity costs have not been considered. Nor does the sum include any accounting of the societal costs of delay, failure, and unrealized potential that may be attributable to poor listening and learning conditions in schools (a 1995 government study revealed that almost 30% of responding school systems identified noise control as their primary environmental problem). It is interesting to note that an estimated 30% of incarcerated adults evidence hearing loss and attendant communications difficulties; that children diagnosed with hearing loss are 3 times more likely to repeat a grade than their age peers with hearing in 'normal' ranges; and that brain and neurological maturation in children has been linked by researchers to the successful development of a system of communication. Poor acoustics compromise the acquisition of language and reading skills and waste our education tax dollars.

Here is an alternative approach with more promise (and less spending):

2/Added First-cost for New Construction Scenario:

☑ *The budget for the construction of a new school is increased to provide acoustical accessibility in all classrooms. Twelve thousand kids get all of the educational and social benefits of quiet classrooms and go on to realize increased potential in their family, public, and working lives. [20classroomsx+$4500=$90,000 added to school budget]*

Estimated school program expenditures (20 year total):	***$ 90,000***
Number of children benefited:	***12,000***
Cost per child served:	***$ 7.50***

At $7.50/child for 20 years of maximum benefit, the new construction alternative is a clear 'shopper's choice'. The pay-as-you-go scenario results in a 30 times greater cost per child benefitted.

Construction Cost Analysis. School systems that design and build new schools to current indoor air quality and energy conservation standards ('high-performing schools') have already taken the biggest and most costly steps toward achieving acoustical accessibility by specifying:

- ☑ ***a ducted central HVAC system, and***
- ☑ ***a high-STC building enclosure (including insulating windows and doors).***

Fire protection and building codes typically require slab-to-slab partitions in classrooms and fire-rated doors; to improve acoustic performance, designers will add:

- ☑ ***doors fitted with good quality drop seals and gasket;,***
- ☑ ***higher-NRC (for reverberation control) acoustical ceiling tiles;***
- ☑ ***an extra layer of drywall or masonry unit insulation (for higher STC partitions).***

And because HVAC systems are a major contributor to background noise, it may be necessary to upgrade distribution to improve acoustical performance by specifying:

- ☑ ***longer duct runs (avoid common ducts that serve more than one room);***
- ☑ ***larger duct cross-sections;***
- ☑ ***more open grilles and diffusers.***

The additional cost per new classroom for the items outlined above will range from $1500 (top quartile) to $4500 (average) for most schools. Construction in low-quartile-expenditure systems where through-wall and unit ventilator HVAC is still being specified must add a further premium for sound enclosures for these types of systems (more costly but quieter European equipment are becoming available). Additional time on the job may also be needed during the transition to conformance with the new standard to ensure the tight caulking and sealing practices necessary to achieve high-performing wall and ceiling assemblies.

Retrofits to existing classrooms -- generally a less-than-ideal solution acoustically -- have averaged about $10,000 per space; many parents are using the new standard to obtain acoustical improvements under IDEA imperatives.

Case Studies. Schools built to the new classroom acoustics standard include several in the state of Connecticut, where the architectural/engineering firm of Fletcher Thompson has integrated ANSI/ASA S12.60-2002 into their school facility design specifications, estimating the additional cost to do so at approximately 1.5% of overall construction costs. A recently-completed Hartford, CT academy budgeted at $11,000,000 included acoustical upgrades costing approximately $50,000, less than a ½% increase.

Estimators in the United Kingdom, where a similar standard is about to take effect by law, anticipated additional costs at 3.3% of the total construction budget for a new school. More detailed analyses project a 1-2% premium. Approximations developed in 1999 by the US Access Board, one of the sponsors of the working group that developed the new standard, suggested that top-quartile-spending school systems would incur an average 0.5% increase to meet ANSI/ASA S12.60-2002, while low-quartile systems might see as much as a 5% overall increase. Average costs were pegged at 3%, very close to the UK estimate. Costs are expected to decline once the new standard is integrated into school design and construction practice.

For more information… The ANSI/ASA S12.60-2002 standard for classroom acoustics was developed by the Acoustical Society of America (ASA) in collaboration with the U.S. Access Board and other stakeholders. Information on ordering the standard and other materials on classroom acoustics, including a videotape, design manuals, and a bibliography, are available on the Board's website at http://www.access-board.gov/publications/acoustic-factsheet.htm. The Board also maintains a toll-free technical assistance line at 1/800/872-2253 (v); 1/800/993-2822 (tty).