SCHOOL FACILITIES AND TECHNOLOGY INTEGRATION

Studies have shown that the use of technology can result in improved learning and achievement when integrated appropriately in student-centered learning environments.[1] Technology tools can help teachers serve as facilitators who are focused on meeting the needs of individual students with different learning styles. Student use of technology promotes development of twenty-first-century skills, such as communication, collaboration, and critical thinking, and allows access to resources for students.[2]

Recent trends in technology for K–12 education include wireless networks with Internet access anywhere and at any time, one-to-one computing for students with small handheld devices and tablets, individualized learning, electronic assessments, audio enhancement systems, document cameras, interactive whiteboards, large-screen displays and projectors, and classroom technology that replaces centralized computer labs. The ability to offer classes online and the use of teleconferencing make hybrid facilities (combining Web-based and brick-and-mortar spaces) an appealing option to be explored.

These and other applications of technology should not be considered in isolation, independent of the learning spaces and curriculum. They should be part of the early design process driven by educational specifications. The Education Technology Web page at the California Department of Education offers a variety of resources to help schools and districts integrate technology with teaching and learning.

Both new construction and modernization of existing school facilities should be approached with the understanding that technology is always advancing. Flexibility with infrastructure improvements will allow for future upgrades as the use of classroom technology is expected to increase over time.

There are many potential applications of technology that have facility design implications. Here are a few examples to consider:

Wi-Fi devices allow personalized learning anywhere and at any time.

Adaptable Spaces: The traditional blocks of identical rectangular classrooms can transition to flexible spaces that are different shapes and sizes, interconnected, and allow for shared resources. This design change will lead to learning spaces that can accommodate both small- and large-group instruction and allow learners to alternate quickly between teacher lectures, project-based teams, and independent work. The use of technology can be enhanced by movable furniture, breakout rooms, operable walls, windows, partitions, and comfortable spaces where students can work while under supervision.

Extended Learning Areas: Wireless networks and handheld portable devices have the potential to transform nonclassroom spaces into extended learning areas. Corridors, alcoves, outdoor areas, and off-campus areas may be used for science experiments, fieldwork, and project-based learning.

Accommodating Furniture: For various types of teaching and learning to take place, furniture must be easily repositioned and stacked in small spaces, enabling active movement among students and teachers. Movable casework can provide convenient access to technology, lab supplies, and research materials. Individual student desks may be replaced by work tables and rolling chairs that are comfortable for sitting or standing.

For more information, contact the California Department of Education, School Facilities and Transportation Services Division, at 916-322-2470.

Electrical Outlets/Charging Stations: Classrooms that use a variety of technology tools and one-to-one computing increase the necessity for access to power. Electrical outlets are commonly found on the perimeter walls, but in some cases it may be advantageous to integrate power sources into floors, ceilings, and furniture. Mobile charging and storage stations may also be needed to secure electronic devices on campus.

Small-group mobile monitors and laptop charging stations.

Lighting Controls: A variety of visual displays in one learning space often calls for accessible lighting controls that allow quick and easy increase or decrease of light. Lighting controls can allow the room to have separate zones with different lighting levels. The effects of glare on screens may also influence the relative location of windows and devices and the need for shading and glare-reducing designs.

Access to Peripheral Devices: As students create and present content in multiple formats, the need for easy access to devices increases. Students will frequently use printers, projectors, monitors, scanners, cameras, copiers, and other devices. These tools will be dispersed to each classroom or to adjacent shared resources rooms. Each will require space, access, connectivity, power, security, and structural mounting or easy means of mobility.

Electronic Storage: As electronic textbooks complement printed textbooks, the spaces previously allocated for book storage decrease. However, secure storage is essential for expensive technology tools and software and for substantial amounts of electronic file storage.

Acoustics: Movable and sound-attenuating walls can prevent disruption to surrounding learning spaces and may accommodate twenty-first-century learning such as video conferencing, virtual classrooms, and personalized instruction.

Technology affects many areas of twenty-first-century learning, including career technical education, blended learning, STEM (science, technology, engineering, and mathematics) learning, physical education, school security, energy conservation, assistive technology for special education, professional development, teacher and parent communication, grading, and more. School facilities can be adapted by modifying or modernizing current learning spaces in order to benefit from the technological advances available to education today and in the future.

Tables are easily moved and stored out of the way.

1. Alan C.K. Cheung and Robert E. Slavin, "How Features of Educational Technology Applications Affect Student Reading Outcomes: A Meta-Analysis," *Educational Research Review* 7, no. 3 (2012): 198–215; and P. David Pearson, Richard E. Ferdig, Robert L. Blomeyer, Jr., and Juan Moran, *The Effects of Technology on Reading Performance in the Middle-School Grades: A Meta-Analysis With Recommendations for Policy.* Napierville, IL: Learning Point Associates/North Central Regional Educational Laboratory, 2005; and Hersh C. Waxman, Meng-Fen Lin, and Georgette Michko, *A Meta-Analysis of the Effectiveness of Teaching and Learning with Technology on Student Outcomes,* Napierville, IL: Learning Point Associates/North Central Regional Educational Laboratory, 2003; and James A. Kulik, *Effects of Using Instructional Technology in Elementary and Secondary Schools: What Controlled Evaluation Studies Say,"* Arlington, VA: SRI International) 2003.
2. Bob Pearlman, "Designing New Learning Environments to Support 21st Century Skills," Chapter 6 in *21st Century Skills: Rethinking How Students Learn,* Bloomington, IN: 2010), 117–47.

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