Collaborative Learning with 21st Century Learning Environments: Leveraging the Assets of Student Diversity

Coalition for Adequate School Housing Conference 2020

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California Department of Education

School Facilities and Transportation Services Division

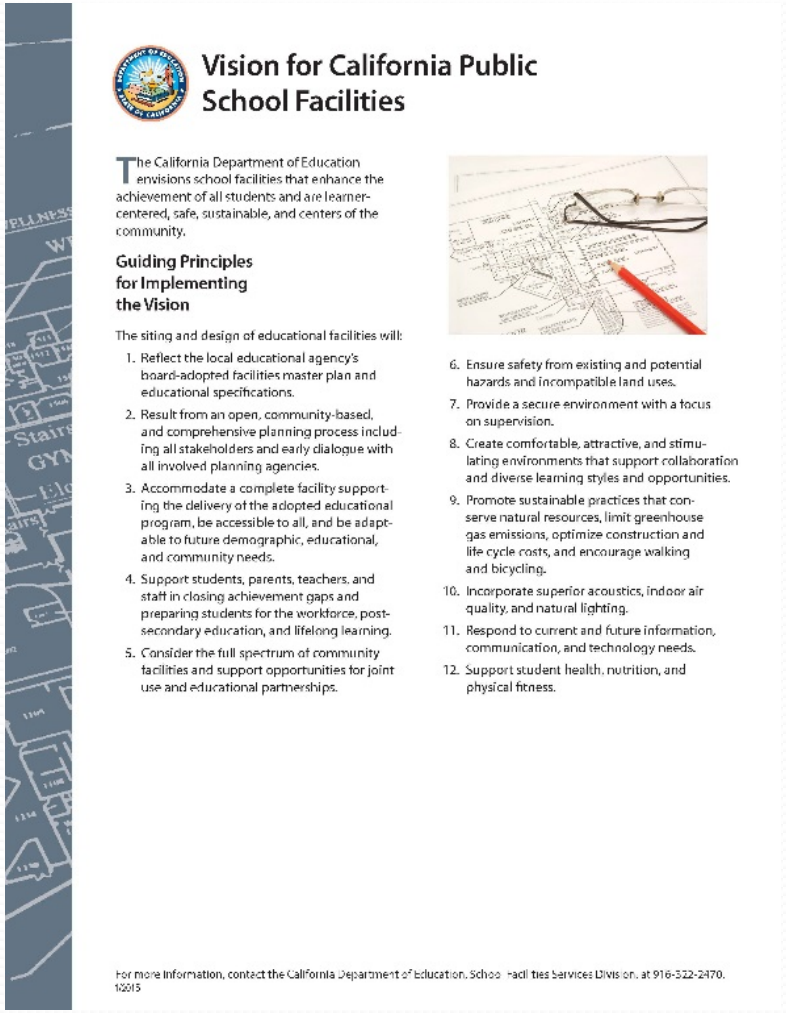
Office of Learning Environments

California Department of Education Mission

California will provide a world-class education for all students, from early childhood to adulthood. The Department of Education serves our state by innovating and collaborating with educators, schools, parents, and community partners. Together, as a team, we prepare students to live, work, and thrive in a multicultural, multilingual, and highly connected world.

Vision for California Public School Facilities

The California Department of Education envisions school facilities that enhance the achievement of all students and are learner-centered, safe, sustainable, and centers of the community.



Vision for California Public School Facilities

The California Department of Education envisions school facilities that enhance the achievement of all students and are learner-centered, safe, sustainable, and centers of the community.

Guiding Principles for Implementing the Vision

The siting and design of educational facilities will:

1. Reflect the local educational agency's board-adopted facilities master plan and educational specifications.
2. Result from an open, community-based, and comprehensive planning process including all stakeholders and early dialogue with all involved planning agencies.
3. Accommodate a complete facility supporting the delivery of the adopted educational program, be accessible to all, and be adaptable to future demographic, educational, and community needs.
4. Support students, parents, teachers, and staff in closing achievement gaps and preparing students for the workforce, postsecondary education, and lifelong learning.
5. Consider the full spectrum of community facilities and support opportunities for joint use and educational partnerships.
6. Ensure safety from existing and potential hazards and incompatible land uses.
7. Provide a secure environment with a focus on supervision.
8. Create comfortable, attractive, and stimulating environments that support collaboration and diverse learning styles and opportunities.
9. Promote sustainable practices that conserve natural resources, limit greenhouse gas emissions, optimize construction and life cycle costs, and encourage walking and bicycling.
10. Incorporate superior acoustics, indoor air quality, and natural lighting.
11. Respond to current and future information, communication, and technology needs.
12. Support student health, nutrition, and physical fitness.

For more information, contact the California Department of Education, School Facilities Services Division, at 916-322-2470.
12015

Presenter Background

- Former Title I Teacher, Curriculum Specialist, Instructional Reform Facilitator, and Teacher Coach for Title I Schools.
- Advocate for equitable education and environments for diverse students.
- Title I Gifted and Talented Education (GATE) teacher with traditionally underrepresented elementary students. This experience provided inspiration to share and implement similar practices with all Title I and diverse students, including multiple intelligence theory, project based learning, deeper learning, Blooms Taxonomy, constructivism, etc.
- Provider of flexible learning environments on a shoe-string budget and utilizing asset-based philosophies.
- Education Programs Consultant for CDE School Facilities for seven years.
- Master of Science in Education: Elementary Curriculum and Instruction with a concentration in 21st Century Learning. Phi Kappa Phi Honors, 2018.

Thesis and Master's Project

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California State University, Fullerton

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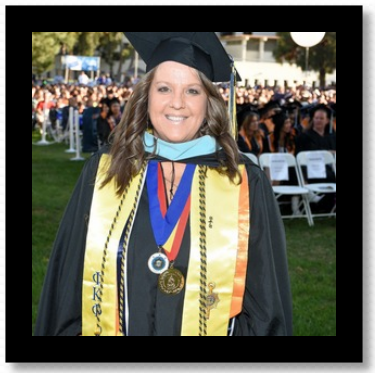
Collaborative Learning with 21st Century Learning Environments: Leveraging the Assets of Student Diversity (2018)



What are Asset-Based Philosophies in Education?

Today's elementary classrooms represent students from many different socioeconomic backgrounds, ethnicities, languages, ability levels, and interests. It is important for students to work together so they can learn about and from each other. Instead of separating students and academic subjects, which limit students' learning opportunities, teachers can use collaborative learning to enhance students' learning outcomes. Collaborative learning allows students to use their individual assets while they work together on 21st century learning skills such as collaboration, communication, critical thinking, and problem solving.

When teachers are able to focus on asset-based learning and achievement rather than classroom management and student behavior, Ladson-Billings (2014) found that students take more responsibility and interest in their own education.

Collaborative Learning Methods that Facilitate 21st Century Learning and Leverage the Assets of Diverse Students

- Heterogeneous Grouping
- Collaborative Strategic Reading (CSR)
- Buddy Reading
- Culturally Inclusive Practices

Language arts instruction offers many opportunities for collaboration. Alexander and Van Wyk (2017) found that the use of cooperative learning with culturally diverse students changed the interactions and communication of students while also increasing mastery of learning and social skills.

Findings suggest that promoting multiple languages in the classroom helps students develop empathy for others and for themselves, and assists students in exploring their multiethnic and multilingual identities and communities, instead of hiding them (Brownell, 2017).

Culturally Inclusive Practices aka Culturally Sustaining Pedagogy (Paris, 2016)

- Encourage and promote biliteracy in the classroom
- Perpetuate and foster linguistic, literate, and cultural pluralism
- Consider using “Emergent Bilingual” terms rather than “English Language Learners”
- Affirm student identities, rather than conforming or assimilating
- Tap into the “funds of knowledge” that students’ families have to offer in order to connect homes and classrooms for diverse learners (Moll, et al., 1992)

In addition to affirming identity during language arts instruction, culturally inclusive practices lend themselves well to collaborative learning in diverse classrooms. Several studies have demonstrated that scripted and passive pedagogical practices do a disservice to ELLs because they do not build on the assets from their linguistic and cultural knowledge (Cummins, 2005; Warschauer, Knobel, & Stone, 2004). In addition, when students are able to take charge of their own learning and invest their own identities in their learning experiences, active learning is more likely to happen, (Cummins, 2005; Ladson-Billings, 2014) which is important to collaborative learning.

How 21st Century Learning Environments Support Collaborative Learning

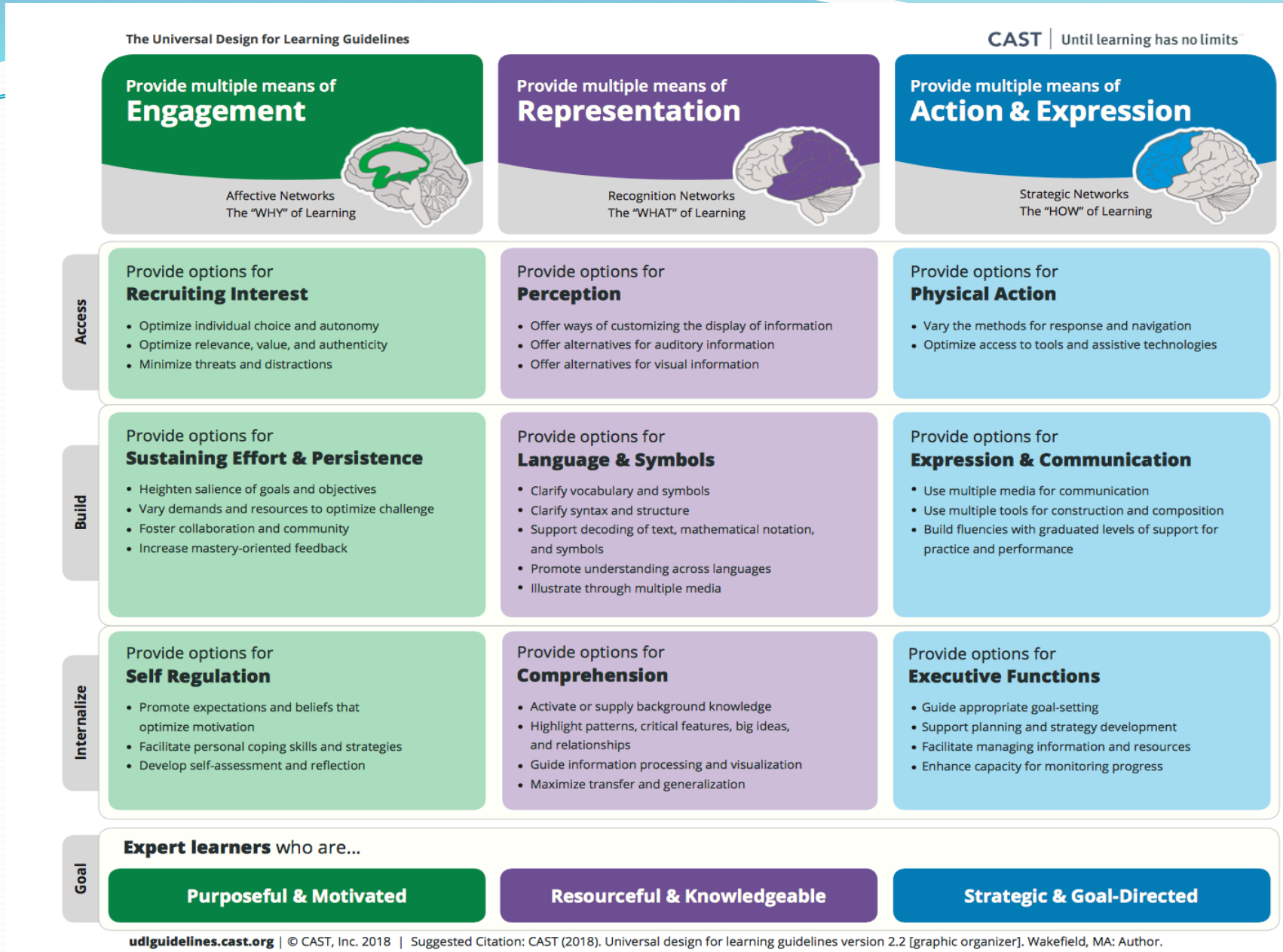
- Interdisciplinary Learning
- Universal Design for Learning (UDL)
- Multi-modal Approaches to Learning
- Technology Integration

Students are experiencing an opportunity gap, due to the lack of equitable access to learning opportunities for minoritized student populations (Chappell & Cahnmann-Taylor, 2013).

Interdisciplinary collaborative units that combine subjects like social studies and the arts with language arts increase student engagement, students' self-concept, and positive attitudes about school (Gardner, Wissick, Schweder, & Canter, 2003; Ritter, 1999; Yorks & Follo, 1993).

UDL provides multiple means of engagement, representation, and action (including technology) to facilitate learners who are purposeful, motivated, resourceful, knowledgeable, and goal-directed (Rao & Torres, 2016).

UDL provides ample opportunities for teachers to design lessons for students from different backgrounds through integration and connection to their cultures, languages, and personal learning preferences (Rao &Torres, 2016).



The Universal Design for Learning Guidelines Text Description

CAST: Center for Applied Special Technology

CAST has received international recognition for development of innovative approaches to expanding educational opportunities for all individuals based on UDL principals.

Design Spaces and Flexible Learning Environments to Effectively Implement 21st Century Collaborative Learning

- Integrate research and best practices on school facilities and learning environments with teacher training and staff development.
- Understand the urgent need to involve teachers of linguistically and culturally diverse students because the students are often learning in outdated and inadequate school facilities.
- Changes can be made to existing spaces with or without funding, as long as teachers are an integral part of this shift to 21st century learning.

In a study by Tanner (2009) that examined school design in 71 schools focusing on school design classifications of movement and circulation, day lighting, and views, the researcher found significantly positive effects on student scores in language arts, reading vocabulary and comprehension, mathematics, and science on the Iowa Test of Basic Skills (ITBS).

How Educators Can Provide Flexible, Collaborative Learning Environments

- Provide collaborative learning spaces that are flexible and offer good movement and circulation patterns (Tanner, 2009).
- Provide alternative seating arrangements with face-to-face contact, which facilitate inquiry and discourse more than row and column seating (Marx, Fuhrer & Hartig, 1999).
- Enable students to use the resources in the room according to their own choices and needs in groups or individually, accessing materials and digital tools as needed, rather than being confined to rows of seating that can stifle creativity (Wesblat & McClellan, 2017).

Outcomes and Findings from the Self-Organized Learning Environments (SOLE) Study

“The SOLE process creates opportunity for the practice of collaboration, the operationalization of rapid shared synthesis of information, the adaptation and leveraging of new and existing knowledge, and the use of technology for student driven learning and presentations.”

“Acknowledges and uses each person’s assets for collective learning and outcomes; establishes positive social capital, creating a pattern for ongoing use of the collective talent.”

“Asset-Based Learning: Utilizing the assets of the individual and allowing the sum effort to add up to more than each part.”

“Students are connected to learning as individuals, as group members, and as contributors during the SOLE process.”

“Valuing 21st-Century Skills: Rapid adaptability and flexibility of the learner, the teacher, and the system via the use of technology to drive authentic inquiry based learning.”

The Disruptive Innovation of Self-Organized Learning Environments, Weisblat and McClellan (2017)

Design Spaces that Promote Development of 21st Century Learning Skills

The Four Cs for Diverse Students

- **Communication:** Communicate effectively in diverse environments that include multilingual and Emergent Bilingual Students, AKA English Language Learners (ELL).
- **Collaboration:** Student-led, inquiry driven, interdisciplinary projects where students work effectively and respectfully with diverse teams.
- **Critical Thinking:** Making decisions, evaluating, risk-taking, flexible thinking, analyzing complex systems.
- **Creativity:** The freedom to decide, student centered learning, visualization, design thinking, open and responsive to diverse perspectives, incorporating group feedback into work.

Design with 21st Century Learning in Mind

- With Common Core State Standards (CCSS), students learn standards and content with greater depth so they are able to use and apply information to real world issues and challenges.
- Students learn to express ideas, work together, and listen carefully to integrate and evaluate information.
- Direct instruction should be minimized but not eliminated.
- Project-based learning enables students to take charge of their own learning (constructivism) and facilitates integration of the arts and other subjects.
- Culturally relevant pedagogy affirms identity in multilingual and multicultural classrooms.
- Utilize community and students' "Funds of Knowledge" to connect homes and classrooms.

Design with Technology in Mind

- Adaptable Spaces
- Extended Learning Areas
- Accommodating Furniture
- Adequate Electrical Charging Stations
- Access to Peripheral Devices
- Secure Electronic Storage

- Flexibility with Infrastructure Improvements
- Ability to Integrate the Constant Flow of New Technologies
- One to One Computing/ Hand-held Devices
- Learning Occurs Anytime, Anyplace, Any Path

Studies show that the use of educational technology applications can produce positive effects for K-12 disadvantaged student achievement outcomes, when compared to traditional teaching methods, but that teacher training in technology and teachers' efforts in using classroom technology show even greater promise for student outcomes (Cheung, 2013; Cheung & Slavin, 2012; Kulik, 2003).

Technology Considerations for 21st Century Learning

- One to One Computing/ Hand-held Devices
- Learning Occurs Anytime, Anyplace, Any Path
- Personalized Learning
- Blended Learning
- The Flipped Classroom
- Project Based Learning
- Centers approach to provide access to technology in classroom environments with limited access to technology

Which Furniture Supports Better Collaboration?

In Which Learning Environment is Collaboration More Likely to Occur?

CDE Fact Sheet: Flexible Learning Environments

View the Flexible Learning Environments Fact Sheet at https://www.cde.ca.gov/ls/fa/bp/documents/bestpracticeflex.pdf.

FLEXIBLE LEARNING ENVIRONMENTS

School and classroom designs should facilitate modern learning methods that prepare students for college, careers, and citizenship in the twenty-first century. Students are expected to show what they know through problem solving and in-depth demonstration of subject matter. As districts move forward in building and modernizing California's school facilities, it is essential to provide flexible learning environments that support diverse teaching and learning needs.

To optimize twenty-first-century teaching methods such as project-based learning and personalized instruction, space should be adaptable to allow multiple learning activities to occur simultaneously. A flexible classroom is fundamental to an instructor's ability to adapt to various needs. The design must allow for a variety of learning environments and grouping formats that consider all learning-style profiles.[1]

Learner-centered classrooms should be designed to accommodate different teaching and learning formats, including:

- Individual study and reflection
- One-on-one instruction
- Peer-to-peer discussion
- Small-group work
- Teacher-directed instruction
- Student presentation[2]

Students will often construct their own learning, and one way to understand flexibility is through five properties that support constructivist teaching pedagogy:

Fluidity represents the design of space for flows of individuals, sight, sound, and air.

Versatility indicates the property of space that allows for multiple uses.

Convertibility designates the ease of adapting educational space for new uses.

Scalability describes a property of space for expansion or contraction.

Modifiability is the spatial property that invites active manipulation and appropriation.[3]

Technology should be seamlessly integrated into the learning space with campus-wide Wi-Fi to allow students access to technology in spaces inside and outside the classroom.

Flexible schools also provide space outside the classroom for collaborative learning, such as:

- Learning studios with abundant daylight, flexible furniture, and space for group projects;
- Open areas, such as atriums and learning "streets"—instead of corridors—to encourage social interaction;
- Project rooms with high ceilings, work tables, and specialized equipment for inventing, creating, and building;
- Multiage rooms where students can mix and match according to interests and aptitudes;
- Outside learning where students work on community service projects and use community sites, such as museums and libraries as classrooms.[4]

Outdoor learning is integrated with standards-based academic subjects and should be utilized as more than a stand-alone learning option. Outdoor learning increases academic learning, and exposure to nature has social, emotional, and physical benefits for students.

In one study conducted for the California Department of Education, elementary students who participated in outdoor science school significantly raised their science scores by 27 percent. The increase in science knowledge was maintained for six to 10 weeks after program participation, with no significant loss in science scores.[5]

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

Flexible Furniture

Collaborative learning spaces call for flexible furniture to allow versatility and modifiability. Classrooms designed to support active learning increase student engagement on multiple measures, as compared to traditional row-by-column classroom seating.[1]

Mobile and flexible seating allow for cooperative learning and easy classroom transitions.

Implementing flexibility in smaller spaces may seem challenging, but with the right furniture configurations, a smaller classroom has room for flexibility when row-by-column classroom seating is modified.

Learn Lab by Steelcase

Multipurpose Classroom by Steelcase

Children have a developmental need for movement, and flexible school furniture allows students to shift position, rock, rotate, and roll. Chairs and tables with wheels and adjustable standing desks offer students the choice of sitting or standing during the school day and provide alternatives for various activities, learning styles, and special needs.

Easy access to materials and wireless technology are integral to creative, inquiry-based learning. Movable storage cabinets and mobile carts allow versatility and convertibility in science labs, shared commons, and other learning areas.

Flexible Design

In learning environments that are designed for flexibility, students may be observed learning while lying down on the carpet or sitting at low tables, on soft seating, or in beanbag chairs. Students may work alone or with a group. Areas with screens or glass partitions allow the instructor to have proximity to the various activities occurring simultaneously.

Innovative school designs may incorporate rolling or sliding doors and movable interior walls that allow linked classrooms to work in common areas or on outdoor learning projects. Shared learning spaces foster a sense of community as students work in teams for STEM (science, technology, engineering, and mathematics), career technical education, and other subjects.

Flexible learning spaces are attainable for existing school facilities as well as modernization and new construction projects. Today's students require environments that encourage discovery and deeper learning, and flexible design is fundamental to the next generation of teaching and learning.

A learner-centered environment with flexible furniture. Randall Elementary School, Kelseyville Unified School District

1. James Seaman, "Agile and Information-Rich Learning Environments" (*Michigan Association of School Administrators [MASA] Leader*, September 2010), 18–19; and Hanover Research, *School Structures That Support 21st Century Learning* (Washington, DC, 2011), 6.
2. Ibid.
3. Lawson Reed Wulsin Jr., "Classroom Design – Literature Review" (Princeton University, 2013), 15; and Toru Monahan, "Built Pedagogies & Technology Practices: Designing for Participatory Learning" (Rensselaer Polytechnic Institute, Proceedings of the Participatory Design Conference, 2008).
4. Hanover Research, *School Structures That Support 21st Century Learning* (Washington, DC, 2011), 6; and Susan Black, "Achievement by Design" (*American School Board Journal*, October 2007), 39–41.
5. American Institutes for Research, "Effects of Outdoor Education Programs for Children in California" (submitted to California Department of Education, January 2015).
6. Lennie Scott-Webber, Aileen Strickland, and Laura Ilieş Kapitula, "How Classroom Design Affects Student Engagement" (Steelcase Education, 2014).

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

CDE Fact Sheet: Technology Integration

View the Flexible Learning Environments Fact Sheet at https://www.cde.ca.gov/ls/fa/bp/documents/bestpracticetech.pdf.

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 Joan Moran, *The Effects of Technology on Reading Performance in the Middle-School Grades: A Meta-Analysis With Recommendations for Policy*. Naperville, IL: Learning Point Associates/North Central Regional Educational Laboratory, 2005; and Herah C. Waxman, Meng-Fen Lin, and Georgette Michko, *A Meta-Analysis of the Effectiveness of Teaching and Learning with Technology on Student Outcomes*, Naperville, 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), 117–43.

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

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Educational Specifications

View the Educational Specifications Fact Sheet at:
https://www.cde.ca.gov/ls/fa/bp/documents/educationalspecsaccessible.pdf

- Educational Specifications are interrelated statements that communicate what educators believe is required to support a specific educational program.
- Ed Specs use words to allow the architect to visualize the educational activity to be conducted.
- Example for an elementary school:

  “Classroom instruction will use project based activities to reinforce lecture. Technology will be used to supplement teacher provided instruction.”

ESSENTIALS IN SCHOOL FACILITIES PLANNING

Educational Specifications

The California Department of Education (CDE) believes that quality educational specifications are key to designing school facilities that successfully support the delivery of educational and community programs and foster effective, safe, and sustainable learning environments.

What Are Educational Specifications?

Educational specifications are used by school districts as the link between the design of school facilities and the educational programs they are intended to support. Educational specifications are for individual projects or for districtwide use and usually contain two components: the educational program and the architectural design program. Educational specifications describe the physical requirements necessary to deliver the educational program, which enables the architect to visualize the educational and extracurricular activities so that the design concepts and solutions support the educational program. Educational specifications also serve as a platform for an inclusive and transparent stakeholder planning process and as a method of developing and communicating the district governing board's facility vision, policies, and standards.

Importance of Educational Specifications

New and modernized schools are an enduring community asset, and spending the time and effort to ensure the success of these facilities is essential. Good planning practices suggest that the design of a new school and the modernization, expansion, or reconfiguration of an existing school should be guided by a comprehensive agreement of affected stakeholders as to how the facilities will be used. Well-developed educational specifications provide clarity for guiding the facility design process and help to create and maintain optimal learning environments.

Another reason why educational specifications are important is because California Title 5 regulations[1] require that the design of a new school will be guided by the educational specifications adopted by the district's governing board.

Transparent and collaboratively developed educational specifications,[2] together with a districtwide facilities master plan, are key tools in building community support for creating high-performing new schools. The facilities master plan includes comprehensive data and board-adopted policies on long-term districtwide facilities needs and plans.[3]

Educational specifications are an important guide for major modernization or renovation projects of existing schools. The capacity and layout of the existing buildings, site constraints, and many other factors may limit the ability to meet growing enrollment or to deliver all of the educational and community programs effectively. Creative solutions based on priorities established in educational specifications are helpful in updating existing facilities to meet current and future needs.

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

School Facilities Research—Academic Performance

The CDE provides summaries of research that demonstrate the link between school facilities and student achievement and the positive impact on:

- Test Scores
- Attendance and Suspension Rates
- Behavior
- Graduation Rates
- Health and Wellness

Earthman, 2002

Students who receive instruction in buildings with good environmental conditions can earn test scores that are 5-17 percent higher than scores for students in substandard buildings.

Heschong Mahone Group, 1999

Boyce, 2004

Studies indicate that student performance is improved by an even distribution of daylight, an expansive view, and limited glare and thermal heat gain. One study found 20 percent faster student progress on math and 26 percent faster progress in reading compared with students in classrooms with less exposure to daylight.

Harner, 1974

Students' reading speed, comprehension, and mathematics performance are adversely effected by room temperatures above 74 degrees.

The Research—Daylighting

A simple way to make a Big difference

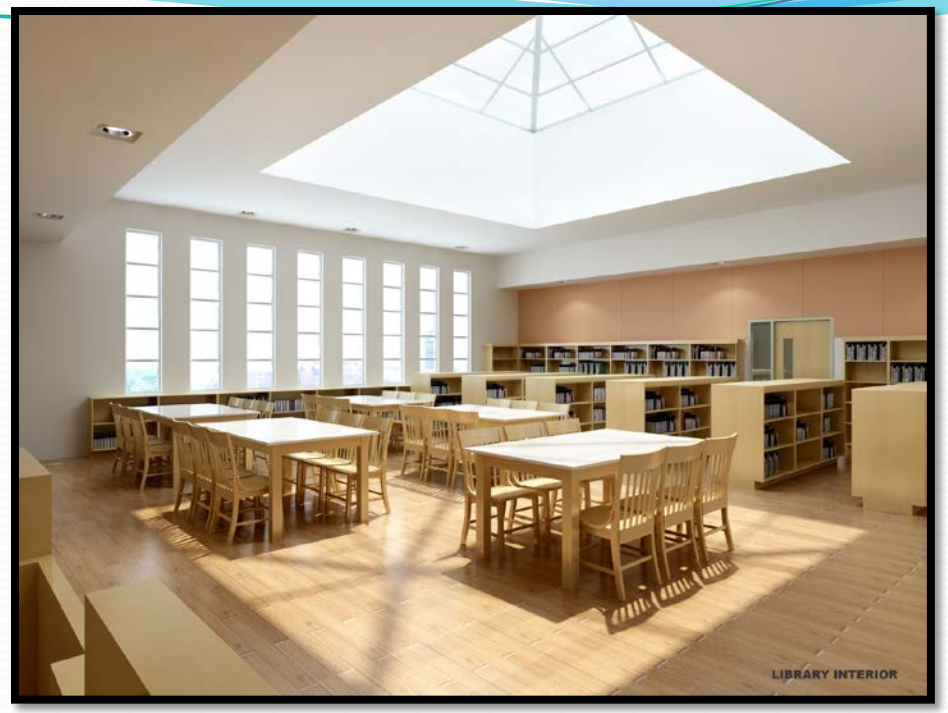
Studies indicate that student performance is improved by an even distribution of daylight, an expansive view, and limited glare and thermal heat gain. One study found 20 percent faster student progress on math and 26 percent faster progress in reading compared with students in classrooms with less exposure to daylight.

(Rensselaer Polytechnic Institute, 2004; Heschong Mahone Group,1999)

CDE Summaries of School Facilities Research:
https://www.cde.ca.gov/ls/fa/re/index.asp

Daylighting

Skylights
Clerestories
Solar Tubes
Transom Windows
Light Shelf Apertures
or….. just open the curtains!

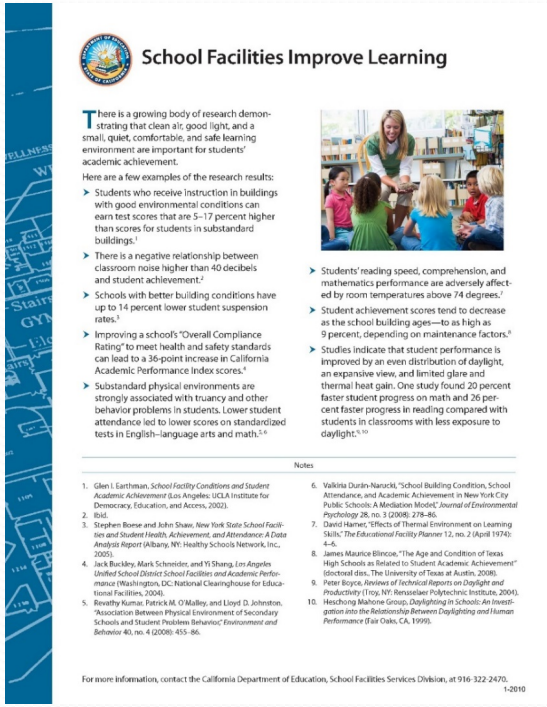


Dover Elementary School Library
West Contra Costa Unified School District

High Tech Charter, San Diego

CDE School Facilities Summaries of Research Web Page

View the School Facilities Improve Learning Summary at https://www.cde.ca.gov/ls/fa/bp/documents/bestpracticeflex.pdf.



School Facilities Improve Learning

There is a growing body of research demonstrating that clean air, good light, and a small, quiet, comfortable, and safe learning environment are important for students' academic achievement.

Here are a few examples of the research results:

- Students who receive instruction in buildings with good environmental conditions can earn test scores that are 5–17 percent higher than scores for students in substandard buildings.[1]
- There is a negative relationship between classroom noise higher than 40 decibels and student achievement.[2]
- Schools with better building conditions have up to 14 percent lower student suspension rates.[3]
- Improving a school's "Overall Compliance Rating" to meet health and safety standards can lead to a 36-point increase in California Academic Performance Index scores.[4]
- Substandard physical environments are strongly associated with truancy and other behavior problems in students. Lower student attendance led to lower scores on standardized tests in English–language arts and math.[5,6]

- Students' reading speed, comprehension, and mathematics performance are adversely affected by room temperatures above 74 degrees.[7]
- Student achievement scores tend to decrease as the school building ages—to as high as 9 percent, depending on maintenance factors.[8]
- Studies indicate that student performance is improved by an even distribution of daylight, an expansive view, and limited glare and thermal heat gain. One study found 20 percent faster student progress on math and 26 percent faster progress in reading compared with students in classrooms with less exposure to daylight.[9,10]

Notes

1. Glen I. Earthman, *School Facility Conditions and Student Academic Achievement* (Los Angeles: UCLA Institute for Democracy, Education, and Access, 2002).
2. Ibid.
3. Stephen Boese and John Shaw, *New York State School Facilities and Student Health, Achievement, and Attendance: A Data Analysis Report* (Albany, NY: Healthy Schools Network, Inc., 2005).
4. Jack Buckley, Mark Schneider, and Yi Shang, *Los Angeles Unified School District School Facilities and Academic Performance* (Washington, DC: National Clearinghouse for Educational Facilities, 2004).
5. Revathy Kumar, Patrick M. O'Malley, and Lloyd D. Johnston, "Association Between Physical Environment of Secondary Schools and Student Problem Behavior," *Environment and Behavior* 40, no. 4 (2008): 455–86.
6. Valkiria Durán-Narucki, "School Building Condition, School Attendance, and Academic Achievement in New York City Public Schools: A Mediation Model," *Journal of Environmental Psychology* 28, no. 3 (2008): 278–86.
7. David Harner, "Effects of Thermal Environment on Learning Skills," *The Educational Facility Planner* 12, no. 2 (April 1974): 4–6.
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9. Peter Boyce, *Reviews of Technical Reports on Daylight and Productivity* (Troy, NY: Rensselaer Polytechnic Institute, 2004).
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View the School Facilities Improve Learning Summary at https://www.cde.ca.gov/ls/fa/re/documents/sustainable.pdf.

Sustainable Schools Improve Learning and the Environment

The recent *National Action Plan for Greening America's Schools* concludes that a sustainable school creates a healthy environment that is conducive to learning and saves energy, resources, and money. Additional benefits of sustainable schools include improved student health, attendance, and academic achievement.[1]

Here are a few more reasons to consider sustainable features:

- A 2006 study showed that sustainable schools use 33 percent less energy and 32 percent less water than conventionally constructed schools, significantly reducing utility costs over the average 42-year life cycle of a school.[2]
- Additional studies show the continuing high cost of energy and utilities. According to national data from 2008, the median annual cost for energy and utilities per student in kindergarten through grade twelve was $295.13.[3]
- Improving a school's health and safety standards can lead to a 36-point increase in California Academic Performance Index scores.[4]
- Because green schools emphasize a healthy indoor environment, a district that builds green schools will benefit from reduced exposure to liability for students' and staff's health-related problems, fewer lawsuits, and less risk of damage to its reputation.[5]
- A school site that uses effective construction techniques can reduce, reuse, and recycle between 50 percent and 75 percent of building materials (e.g., brick, asphalt, wood, plastic, glass, gypsum board, and carpet), thereby reducing environmental impacts.[6]

- Attention to school siting practices can improve solar access; take advantage of natural air flows; maximize daylighting; and increase easy and safe pedestrian, bicycle, and mass transit options.[7,8]
- Substandard physical environments are strongly associated with truancy and other behavior problems in students. Lower student attendance led to lower scores on standardized tests in English–language arts and math and to less funding.[9,10]
- Studies indicate that student performance is improved by an even distribution of daylight, an expansive view, and limited glare and thermal heat gain. One study found 20 percent faster student progress on math and 26 percent faster progress in reading compared with students in classrooms with less exposure to daylight.[11,12]

Notes

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CDE School Facilities Summaries of Research

View the School Facilities Improve Learning Summary at https://www.cde.ca.gov/ls/fa/re/documents/centersofcommunity.pdf.

View the School Facilities Improve Learning Summary at https://www.cde.ca.gov/ls/fa/re/documents/safeschools.pdf.

Schools as Centers of Community Improve Learning

Many recent documents support the concept that schools are centers of community. Research shows that this concept boosts student achievement and focuses community life. Some reports also advocate the fiscal soundness of the concept and others point to the environmental advantages of land use. A 2003 evaluation of 20 community school initiatives across the United States yielded the following findings about schools that function as centers of community:

- Improved student academic performance
- Improved attendance
- Improved graduation rates
- Reduced dropout rates
- Reduced behavioral/discipline problems
- Increased access to physical and mental health services [1,2]

Here are reasons to consider building schools that function as centers of community:

- The U.S. Environmental Protection Agency (EPA) views schools as the key to promoting economic development, strengthening neighborhoods, and improving human and environmental health.[3]
- According to the EPA, a centrally located school with sidewalks and safe walking and biking routes can reduce air pollution and promote other healthy community benefits, such as joint-use arrangements.[4,5]

- Schools that function as centers of community may be open late or longer for community use—or they may have been designed to provide the community with other services, such as a public library, performing arts center, fine arts center, senior center, health clinic, community college branch, sports stadium, public park, or museum.[6,7]
- Co-location is a concept according to which public services are placed together in one location. The benefits are cost savings and community support for the tax increases required to repay school construction bonds.[8,9]
- Many perceived obstacles to joint use can be overcome with agreements between agency groups that typically function in "silos." The cost benefits to communities can be substantial.[10,11]

Notes

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Safe Schools Foster Improved Student Learning

Everyone wants safe schools for their children. Current research shows that the definition of "safe" involves three areas that school facilities planning groups should consider:

- Potential physical hazards
- Environmental conditions of the site and of the building
- Crime/violence prevention

Some research findings and resources are provided below:

- The California Department of Education provides a guide to help districts review certain health and safety requirements. The guide identifies potential physical hazards and environmental safety conditions, such as proximity to airports, transmission lines, railroads, underground pipelines, and propane tanks.[1]
- Potable water, fire safety, adequate lavatories, security systems, and good communication systems for use in emergencies are important priorities for schools as they plan for the health and safety of students.[2]
- Concern about traffic and street crossings is among the most commonly cited reasons parents do not let their children walk to school or engage in free play on the streets.[3]
- Several studies have determined that children suffer significant health consequences from excessive heat; inadequate heating, ventilation, and air conditioning systems; mold and other biological hazards; pest infestations; lead and other toxic hazards; and overcrowding beyond the stated capacity of the school structure.[4]
- Research repeatedly shows the detrimental impact of high levels of lead and poor indoor air quality in classrooms.[5]

- One study of the Los Angeles Unified School District showed that a school's compliance with health and safety regulations can lead, on average, to a 36-point increase in California Academic Performance Index scores.[6]
- Students who attend small schools have a stronger sense of identity and belonging, of being connected to a community, than students who attend large schools. Additionally, the full range of negative social behavior—from classroom disruption to assault—is far less common in small schools, traditional and new, than it is in large schools.[7,8]
- The practice of "crime prevention through environmental design" embraces three proven concepts to make school sites safer: natural surveillance, natural access control, and territoriality. Simple, low-cost measures—for example, those involving furniture layouts, campus lighting, landscaping, reconfiguration of access points, and establishment of clear borders—are basic first steps to reducing crime on campus.[9]
- Schools with better building conditions have up to 14 percent lower student suspension rates.[10]

Notes

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Self Organized Learning Environment (SOLE) Example

Peter Burnett Elementary Title I School
Sacramento, 1998

Research:
The Disruptive Innovation of Self-Organized Learning Environments
(2017) by
Weisblat and McClellan

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To access the link to the literature review and full text of thesis visit:

https://mollystitt.weebly.com/

https://padlet.com/mollyms/learning_environments_guidance

CDE Best Practices and Resources Fact Sheets
https://www.cde.ca.gov/ls/fa/bp/

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http://udlguidelines.cast.org

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Provide options for **Recruiting Interest** Optimize individual choice and autonomy. Optimize relevance, value, and authenticity. Minimize threats and distractions. **Sustaining Effort and Persistence** Heighten salience of goals and objectives. Vary demands and resources to optimize challenge. Foster collaboration and community. Increase mastery-oriented feedback. **Self-Regulation** Promote expectations and beliefs that optimize motivation. Facilitate personal coping skills and strategies. Develop self-assessment and reflection. **Goal:** Expert learners who are… **Purposeful and Motivated**	Provide options for **Perception** Offer ways of customizing the display of information. Offer alternatives for auditory and visual information. **Language and Symbols** Clarify vocabulary and symbols. Clarify syntax and structure. Support decoding of text, mathematical notation, and symbols. Promote understanding across languages. Illustrate through multiple media. **Comprehension** Activate or supply background knowledge. Highlight patterns, critical features, big ideas, and relationships. Guide information processing and visualization. Maximize transfer and generalization. **Goal:** Expert learners who are… **Resourceful and Knowledgeable**	Provide options for **Physical Action** Vary the methods for response and navigation. Optimize access to tools and assistive technologies. **Expression and Communication** Use multiple media for communication. Use multiple tools for construction and composition. Build fluencies with graduated levels of support for practice and performance. **Executive Functions** Guide appropriate goal-setting. Support planning and strategy development. Facilitate managing information and resources. Enhance capacity for monitoring progress. **Goal:** Expert learners who are… **Strategic and Goal-Directed**

CAST (2018). Universal Design for Learning Guidelines version 2.2.
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