Implications for 21st Century Learning

Curriculum and Instruction

Current Thinking

Curriculum is typically based on core subjects that include English, reading/language arts, world languages, arts, mathematics, economics, science, geography, history, government and civics. Themes such as global awareness, financial, economic, business and literacy (entrepreneurial, civic, health, and environmental) are often incorporated. Skills that are generally considered necessary for success in the twenty-first century business world include research and communication, thinking and problem solving, interpersonal relations, and self-directional information technology. Notably, these skills are among those included in the twenty-first century skills gap — a label given to abilities that are lacking in today’s students entering the workplace.

Skills provide specific application of core subjects and themes, and may be subdivided as follows:

- Life and Career Skills: flexibility and adaptability, initiative and self-direction, social and cross-cultural skills, productivity and accountability, leadership and responsibility
- Learning and Innovation Skills: creativity and innovation, critical thinking and problem solving, communication and collaboration
- Information, Media and Technology Skills: information literacy, media literacy, information, communication and technology (ITC) literacy
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Another way to understand 21st Century learning is to consider the following characteristics as a preview of a successful program: teachers as leaders and guides, project-based curriculum, final presentations (to classmates and outside experts), “office setting” with personalized spaces for individual and group learning. Computer access is critical.

Consider…“If students know how to learn, they don’t need to be told what to learn.”

Many of the following 21st Century learning characteristics address the environment of the learner: privacy, personal space, resource access, control of environment, physical comfort, team mobility, flexibility, variably sized spaces, and technology.

When addressing instruction, the following components are commonly considered for a comprehensive 21st Century education program: student knowledge and skills, education support systems, education leadership, institutional policymaking, partnering, and continuous improvement/strategic planning.

Finally, curriculum and instruction must be informed by feedback from 21st Century learning communities regarding their effectiveness. Among many useful aspects to consider are encouragement for students, professional development for teachers and staff, performance measurement, and evaluation.

DoDEA Direction

These key ideas and common themes are most useful in further consideration of 21st Century curriculum and instruction:

- Provide hands-on learning that is personalized to meet individual learning needs.
- Provide instruction that is diverse and accommodates multiple learning styles.
- Provide one-to-one learning using current technology.
- Give students accountability for their own learning.
- Consider delivering instruction using technology that is native to students: smart phones, the Internet, computers, and post-computer devices (iPad).
- Provide project-based learning experiences: team work, problem solving, presentation, interaction with outside experts.
- Integrate technology into education.
- Provide integrated and interdisciplinary instruction.
- Emphasize the role of teachers as facilitators and connectors.
- Emphasize rigor in learning.
- Provide real-world skills development.
- STEM (science, technology, engineering, mathematics) needs to include the arts; consider STEAM (science, technology, engineering, arts and mathematics).
- Emphasize curriculum constructs: communication, collaboration, critical thinking and problem solving, supported by the core curriculum.
Facilities for 21st Century Learning

Current Thinking

Facility design for schools has evolved over time from the traditional classroom of the nineteenth century, with one teacher addressing a roomful of students sitting in individual desks all facing forward to the teacher’s desk, to the open-plan schools of the 1970s, with various seating arrangements and sizes of classes, supplemented by temporary or modular classroom buildings used when student populations surge. Increasingly, schools originally built with an open-plan are being modified to enclose the open classrooms. Ironically, schools originally built with traditional, enclosed classrooms, often along a double-loaded narrow corridor, are frequently being modified to remove the walls making them more open to provide a variety of spaces and to increase available daylight to the interior.

DoDEA Direction

- Create adaptable and flexible spaces – agile buildings that can change over time:
  - Accommodate change within the structure of the schools.
  - Pursue higher utilization of large, single-use spaces (cafeteria, auditorium, gym).
  - Provide spaces that can be quickly and easily adapted by teachers and students.
- Provide a variety of spaces to accommodate all learning styles:
  - Reassign existing facilities to provide for varying spaces.
  - Provide breakout areas for flexible learning spaces.
- Incorporate formal and informal learning spaces.
- Use school building and the local community (including the military installation).
- Invite and provide for different community elements in the school (i.e., teen community, parent community, general public, etc.).
- Accommodate all users – students, faculty and parents.
- Embrace virtual education with supporting physical space.
- Use non-assigned circulation space for learning.
- Allow for protected exterior space as an extension of the learning space.
- Balance the need for a securable facility with desired characteristics of open, collaborative and aesthetically pleasing space.
- Consider distributing media areas (library, technology) throughout the school.

Consider the Apple Computer retail store as a model for learning spaces that are open, inviting, and participatory with specialty areas for targeted support functions.

Consider the openness and flexibility in the layout of a professional office as a model for learning centers.

Building patterns to consider:
- Visually supervised open space
- Central greeting/gate keeper
- Signature identity spaces, in part to aid transition of transferred students
- Distribute technology throughout the school.
Implications for 21st Century Learning

Institutional Implementation

Institutional policy is the engine that propels 21st Century learning. It provides the plan and course of action to influence and direct 21st Century education. Institutional policy is a critical resource for the implementation of curriculum, instruction and facilities.

Current Thinking

The purpose of DoDEA is to educate the children of Department of Defense military and civilian families worldwide. The mission of the U.S. Department of Education includes promoting student achievement and preparation for global competitiveness by fostering educational excellence and ensuring equal access to learning.

Current institutional policy is varied but includes actions necessary to support the curriculum and instruction described previously.

DoDEA Direction

The Deputy Assistant Secretary of Defense for Military Community and Family Policy issued this challenge when he said, “Schools must be conducive to 21st Century learning, spark learning and provide instruction in the sciences and the arts.” These key ideas and common themes will be most useful in further consideration of 21st Century institutional implementation:

- Enable change.
- Support the educator:
  - Define a process of inclusion for faculty development
  - Focus on consistent guiding principles and objectives.
  - Communicate expectations for all stakeholders – students, parents, faculty, administrators, and the local community.
- Identify possible contributors to success.
- Craft a shared vision of what a 21st Century school means.
- Capitalize on military techniques to improve learning and immersion:
  - “...Adapt, adjust, improvise and prevail, prevail, prevail.”
- Insist on transportable student profile data that is critical for the students’ transitions between grades and between schools.
- Produce students that are trainable, rather than specialized with vocational training.
- Challenge the traditional vocabulary to embrace new ideas and avoid only repeating the past (i.e., classroom, school).

Entice people to use the new 21st Century learning spaces.

Enable the school to be the activity center of the local community, especially for family support services:

- Consider addressing all facilities on the military installation when designing school facilities.

Align professional development to enhance future use of facilities.

Create demonstration schools – pilot the next idea now, and provide lots of training.
Implications for 21st Century Learning

Safety and Security

There is a high level of interest in maintaining an inviting and non-institutional environment while simultaneously providing a safe environment for students, staff, and the community who use the facility and adjacent support services. The organization of a building can have a major impact on student behavior and safety. Building security can be addressed in an active or a passive manner: active security is based on security systems; passive security is based on program design, building layout, and community participation. Schools should be based on passive concepts with applied active concepts where necessary.

If designers focus on the symptoms of the safety problem, they tend to focus on the active security procedures that can be implemented. If designers focus on the cause of the problem, they are likely to address most issues through passive or program and building layout solutions.

The problems and their causes are multi-dimensional: some issues can be more easily addressed in design than others. Causes can include, family problems, lack of sense of belonging, lack of identity, lack of communication, lack of accountability, lack of student/teacher relationships, and criminal activities by outsiders.

The greatest number of discipline problems in a school occur when students switch classes and travel from one end of the building to the other. Reducing movement by having students spend the majority of their day in one section of the building should result in fewer discipline problems. Block scheduling, sometimes used in middle schools, is one approach that helps reduce pedestrian traffic within the building.

Organizing a building into general learning settings may reduce behavior problems:
- Teacher preparation areas place adults in closer and more direct contact with students.
- Students spend the majority of their day in the neighborhood and commons which promotes a greater sense of belonging and identity.
- School pride becomes more apparent.

The glass wall into the administration reception/waiting area in the pictures to the right provides good visibility of the main entrance. It serves a dual purpose of being inviting and welcoming to visitors while allowing administrative staff to monitor access during school hours. Way-finding is crucial to a successful school facility. The front entrance and reception area should be immediately obvious to anyone approaching and entering the building. Similarly, glass can provide security and visibility if the right materials are used.
Facilities for 21st Century Learning

Implications for 21st Century Learning

Student-Centered Education

Current Thinking

Students have a wide variety of needs that evolve over time. Each child maintains his or her own unique set of emotional, physical, and social needs that directly influence how he or she responds to life and to education. Therefore, to prepare students appropriately, contemporary trends in education must recognize and respond to these evolving individualized needs so that each child develops necessary competencies while also receiving the personal support they need.

Beyond this, students in military families are often working through additional intense life situations as the result of circumstances. These circumstances may include long-term parental deployment, single-parent anxiety and depression, personal separation anxiety and depression, frequent short-term (potentially international) relocations, and additional circumstances unique to military life. Children, unlike their parents, are not positioned to legally act on their own behalf or make personal decisions that immediately address these issues and need additional resources to navigate. DoDEA helps provide additional resources to nurture these students through each stage of development.

The Department of Defense, including the United States military, is a resourceful institution that has developed the world’s most advanced technology, has trained the world’s greatest soldiers and leaders, is located around the world, and has developed a cadre of services to support military employees, active service members, and their families. The military schools benefit from DoDEA’s commitment to develop optimal learning environments for twenty-first century students.

DoDEA Direction

Broad learning opportunities must be reintroduced both inside and outside the walls of DoDEA schools. In addition, K-12 learning should facilitate the intellectual curiosity and creativity that spurs the emotional, physical, social, and cultural growth of students as they learn. Both teachers and parents must understand and commit to 21st Century pedagogy to more fully utilize 21st Century buildings.
FACILITIES FOR 21ST CENTURY LEARNING

Implications for 21st Century Learning

Sustainable Design Strategies

Sustainable schools are healthy for students, teachers and the environment. Sustainable schools are productive learning environments with ample natural light, high-quality acoustics and air that is safe to breathe.

School facilities that are designed and constructed according to sustainable principles demonstrate and encourage stewardship in students, thus also addressing the future lives of the learners. In addition, the school building can be a teaching tool for sustainability, for example, students can learn about alternative energy from the solar panels on the roof of the school. Because of the use of efficient materials and available sustainability technology, the building can become a three-dimensional learning space.

The US. Green Building Council (USGBC), a nonprofit organization, was founded to promote the design and construction of buildings that are environmentally responsible. Green design refers to design and construction practices that significantly reduce or eliminate the negative impact of buildings on the environment and occupants.

The USGBC developed and maintains the Leadership in Energy and Environmental Design (LEED) Green Building Rating System. LEED is the national benchmark for buildings promoting sustainable design and construction. The objectives of LEED include:

- Reduce impacts of natural resource consumption.
- Protect air quality and water quality, biodiversity, and eco-system health.
- Improve economics of building operations, asset value, worker productivity, and the local economy.
- Enhance building occupants health and safety, relating to risk management.
- Minimize strain on local infrastructure such as landfills, water supply, stormwater sewers and related development and costs; decrease transportation development and maintenance for roadways, and encourage better performance of mass transit systems.

The LEED for Schools Rating System recognizes the unique nature of the design and construction of educational facilities and provides verification that a building project, whether new or renovated, is sensitive to the environment. It addresses such issues as classroom acoustics, mold prevention, environmental site assessment, and other matters related to school design and operation. Green schools are healthy places to learn, to teach, save money, provide hands-on learning and are environmentally friendly.

The following LEED planning principles are useful guidelines when renovating or constructing new schools.

**Sustainable Sites**
- Construction activity pollution prevention
- Protect or restore habitat
- Stormwater design (i.e. using existing natural features such as ponds and creeks enhanced by constructed basins, and lot-line swales over gutter-and-pipe engineering)
- Joint use of facilities

**Water Efficiency**
- No potable use or no irrigation
- Water use reduction (i.e. use collected rainwater or gray water for toilet and urinal flushing or other non-potable uses)

**Energy & Atmosphere**
- Optimize energy performance
- On-Site renewable energy (i.e. geothermal, hydro-electric, solar, wind)
- Green power (i.e. purchase of green electricity)

**Materials & Resources**
- Storage & collection of recyclables
- Building reuse
- Construction waste management
- Regional materials
- Rapidly renewable materials (i.e. bamboo flooring, cork wall covering)
- Certified wood (wood/paper that comes from good forest management)

**Indoor Environmental Quality**
- Increased ventilation
- Outdoor air delivery monitoring
- Low-emitting materials
FACILITIES FOR 21ST CENTURY LEARNING

Implications for 21st Century Learning

Technology

Today, technology is used extensively to help students learn basic and critical thinking skills. In the future, the applications and capabilities of educational and information management technology should increase dramatically. Today, the majority of jobs require at least some technological proficiency and as such, it is expected that students leave school with the ability to work with and use technology.

The implementation of voice, video, and data cabling throughout school facilities is becoming standard in schools across the country. Appropriate, strategically designed technology greatly enhances the teaching and learning of basic skills and positions the school to take advantage of technological developments in the future.

To take advantage of technology, schools also need comprehensive staff development programs and training; student access to technology applications; updated hardware and software in computer labs, classrooms, and information centers; wireless access points; updated school wiring and Internet access; integration of technology into the academic content standards; home to school access; technical support personnel at the school level; and a security system that protects and encourages use of equipment.

All classrooms should be multi-use/multi-purpose with invisible technological support. There should be a seamless web of technology to support the classroom management between administration, teachers, students, and the home.

Research suggests that multi-sensory teaching improves student mastery of basic skills. Technology supports visual, auditory, and experiential learning; therefore, it is recommended that all instructional spaces have voice, video, and data accessibility. This access also enhances the flexibility of the learning environment to respond to alterations in the use of space. The wiring and other infrastructure components should be the first priority since terminal devices can be added later; however, wireless networks should also be included. The facility should have surplus electrical power capacity and network wiring/bandwidth to permit expansion of technology.

It is important that all students demonstrate technology skills appropriate to their grade level. Students are expected to acquire technology skills through authentic learning opportunities and using applicable technology.

Technology Components

Voice: Telephone and voice communications in every classroom and workspace to support internal and external communications.

Video: Video distribution in every learning studio and throughout the building with interactive video capabilities to support whole-group and small-group instruction and distance learning, providing access to a wide range of internal and external resources.

Data: Data retrieval capabilities in every classroom and throughout the building as well as Internet network capabilities to other external resources.

Today’s schools are equipped to support management and instructional applications. Current digital voice, data and video systems can provide instruction, data management, Internet, and student services that go far beyond the systems in schools that were constructed as recently as the late 1990s. Technology is becoming increasingly useful and appropriate to the student and the educator. As home and business worlds move toward higher levels of technological applications, it is critical for schools to be adequately equipped and adopt a leadership role in the integration of technology into the teaching, learning, and communication processes.
Applications of Technology

Technology has four primary applications within the school environment. These applications have the potential to have a positive impact on every aspect of the educational process. The four primary applications include:

1. Communication/productivity: e-mail, word processing, database, spreadsheets, telephone, homework, web pages
2. Student services: schedules, grades, attendance, counseling, transportation, food services
3. Educational technology: media centers, computer applications, A/V applications, online learning
4. Business systems: accounting, payroll, inventory

Technology and the Learning Environment

Technology greatly enhances the learning environment. Technology, in the typical classroom, can support multiple instructional designs:

1. Whole group instruction (20-30 students). This includes the use of document readers, computer projectors, DVD players, flat screen monitors, smart boards, LCD flat panels and other forms of computer display techniques.
2. Small group instruction (six to eight students). This includes areas in the classroom and in shared common spaces, in which a teacher or another resource person can work with groups of students. The technology is essentially the same as whole group instruction technology, the only difference being the size of the groups.
3. Individualized instruction (one to two students). This is primarily computer-based instruction with online courses in which students interact with a computer workstation. It is envisioned that these computers are laptops that integrate voice, video, and data formats and have high speed Internet access.

The diagram below represents typical technology applications found in schools today.

Learning Studio

It is recommended that all learning studios have voice, data, wireless internet, and video accessibility. This should enhance the flexibility of the learning environment to respond to alterations in the use of space. The following components should be included in each learning studio:

- Teacher workstation or laptop with data drops
- Student laptops or tablet computers
- Data outlets for student laptops or work stations
- Wireless access
- If possible, audio classroom enhancements with volume control
- Support for document readers
- Interactive white board with integrated projector and data drop
- Intercom/PA system
- Sufficient data ports, electric outlets, and power supply to accommodate laptops, workstations, printers and other technology devices
- Wall or ceiling mounted data port and outlets to support wireless router

Careful attention should be given to furnishings, i.e., student desks, specialized or customized cabinetry, location of data ports, white boards, and monitors. It is suggested that student furniture be tables and chairs and not individual desks.
Cafeteria
Technology in the cafeteria serves multiple purposes. Key pads or scanning devices should be used to allow students to enter identification confidentially. Technology can also be used to provide audio enhancement and also allow for visual presentation on one or multiple walls within the cafeteria.

Wireless Access Points (WAPs)
Wireless access points should be located in facilities that allow access to wireless technology without interruption. Consideration should be given to high traffic volume areas such as learning neighborhoods, information centers, and cafeterias. It is intended that access to technology is seamless and pervasive throughout the building.

Classroom Audio Enhancements
Audio enhancement is intended to improve sound quality and provide noise reduction in the learning environment. This device must be mobile and adaptable for different instructors, be easy to use (seamless), and must be durable as it is used on a daily basis. Providing appropriate speakers and proper location should be considered when providing this tool.

Flat Screen Monitors
Flat screen monitors in the facility should be sized and mounted appropriately for the space that they are located. Consideration for quality of picture, life expectancy of monitor, glare, and access to power should be given.

Interactive White Board
Interactive white board technology should be provided in all learning communities and strategically placed in the facility (including the information center and physical education spaces). The latest interactive white board technology uses wireless technology and many have alternative power sources, thus providing flexibility of location.

Document Reader
Document readers should be provided within the learning community and other learning spaces as appropriate for the current curriculum. These devices generally are mobile and can be easily stored in lockable cabinets.
Facilities for 21st Century Learning

- Lighting system design & controllability
- Thermal comfort design & controllability
- Daylight & views (75-90 percent of classrooms & other spaces)
- Enhanced acoustical performance
- Mold prevention

Sustainability Considerations
Establish sustainability goals at the conceptual stage of project development:
- Fuel usage
- Water usage
- Electricity usage
- Maintenance expenditures
- Training expenditures

Consider building orientation to take advantage of the site characteristics:
- Provide south facing windows to maximize natural light infiltration.
- Use natural features to protect from wind loads.
- Consider predominant wind direction when identifying window size and location.
- Consider predominant wind, and snow drift direction when identifying door and building ventilation location.
- Consider that the majority of usage will take place during the school year (September-May).

Consider joint-use of a school facility with other organizations such as community schools programs, community health programs, mental health programs, senior care or service programs or other programs compatible with the school mission.

Consider a choice of heating and ventilation alternatives that provide the district with the best combination of energy efficiency and ease of maintenance.

Consider day-lighting alternatives that minimize the use of artificial lighting throughout the building while still providing adequate insulation characteristics for the school location. Compare costs of alternative day-lighting strategies in terms of electricity cost, as well as anticipated heating costs.

Consider strategies to minimize water use:
- Low-flow double-flush toilets
- Waterless urinals
- Recapture of grey-water and treatment for non-potable water uses
- Rainwater recovery systems

Compare the cost of increasing insulation R-values versus the long-term benefit of decreased heating costs.

Consider computer controlled heating, ventilation and lighting controls with remote monitoring and data collection capacity to monitor and analyze energy usage.

Consider rapidly renewable materials.

Consider use of regionally available materials.

Establish a minimum Indoor Air Quality (IAQ) standard and develop a process to monitor IAQ during peak usage.

Establish a minimum acoustical performance standard and verify with commissioning.

Establish a minimum classroom and hallway lighting level and verify with commissioning.

Refer also to DoDEA Administrative Instruction for Sustainability and Energy Efficiency.

The school pictured uses native plants and natural wild flower grasses and provides water quality treatment on site with an outlet into an existing creek.