A
SCHOOL
FOR EVERYONE

A School Designed to Support the Education of Students with Disabilities Volume 2

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This manual is dedicated to the memory of Gerard J. Dynes who was a passionate advocate for the education of students with autism, and an enthusiastic contributor to our research on school facilities supportive of students with disabilities.

Acknowledgements

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Most of us have spent a large portion of the first two decades of our lives in school buildings built and often rebuilt several times over the past hundred years. For recent graduates, the schoolhouse may have meant an eclectic mix of glass atria and angled walls interspersed with a diversity of learning spaces. Others remember the sprawling and elongated buildings of the 1960s with their rectangular tentacles extending horizontally over flat acreage. Still others recall the multi-story brick edifices of the first half of the century with their double-loaded corridors, large windows, high ceilings and colonnaded entrances. For many, the memory involves a combination of the above, with successive additions added to accommodate ever-growing school districts.

The older school buildings often had the words, "Boys" and "Girls", emblazoned in cement over separate entrances. While these labels may had meaning for students at one time, few of those reading this book today would have paid any heed to their directive. Our entrances, like our classes, were or are co-ed, partly because research has long since suggested that separate classrooms reinforce gender stereotypes but also because

common sense counseled if boys and girls learned to work and play together at school they would benefit from this experience throughout their lives. "A boy who has never been beaten by a girl on an algebra test could have some major problems having a female supervisor," Kim Gandy, president of the National Organization for Women observed. "The question always must be: What are you trying to accomplish with separating the students and how will you do it?" said Rosemary C. Salamone, author of *Same, Different, Equal: Rethinking Single Sex Schooling*, and a professor of law at St. John's University (New York Times, 3/10/09).

The same could be said of the inclusion of students with disabilities. Children who have never cooperated with peers with abilities and disabilities different from their own may have difficulty throughout their lives relating to those outside of their own cohort. Inclusion, not just of genders, but also of cultures, languages, and abilities has become a byword of the twenty-first century, and inclusive practices often begin in schools. To continue the gender analogy, however, there are benefits to attending an all girls/boys school and some students and parents/guardians feel that those benefits, for them,

outweigh the inevitable losses. The same holds true for schools that specialize in educating students with disabilities. In our first year of research into school facilities supportive of students with disabilities we looked exclusively at "inclusive schools." We found, among many other things, that inclusive schools were including many students with learning and sensory disabilities, a number of students with behavioral issues, and some students with physical disabilities, Aspergers and mild cognitive disabilities. We did not see many students with multiple pronounced disabilities, or with moderate to severe cognitive and/or intellectual impairments. This set limits on our empirically-driven, evidence-based research – we observed a lack of evidence. It also piqued our curiosity. Where were these students and

why were they not included? Specifically, how did the physical environment of the schools they were attending differ from the environment of the inclusive schools we had studied? Could the spatial and physical needs of students with disabilities be accommodated in an inclusive school environment? Or could an environment that met the needs of students excluded from inclusive schools, also include typical students? What about the educational and social needs of students with disabilities – could these diverse needs be met in an environment that includes typical students – those without obvious disabilities? These were the questions we asked as we approached the second year of our study of school facilities that accommodate and educate students with disabilities. Our evidence, in this second year of research,

came from schools devoted to students with disabilities: Horizon Lower School and Horizon High School in Essex County, Lehman, SCHI, and Schroth Schools in Monmouth and Ocean Counties, and Jersey City Regional Day School and A. Harry Moore School, also in Jersey City.

Coherence between philosophy of inclusion, practice of inclusion and a building designed to support the inclusion of students with disabilities will be essential to any education program that is truly inclusive. This manual deals with the latter and, in particular, looks at some of the differences between the physical environment of special education school and typical school facilities.

The environment impacts its inhabitants in multiple ways. The physical environment allows or bars access depending on the person-environment fit. Some school buildings allow all to enter through the front door, some welcome typical students at the front door and direct others to a back entrance and some turn most students with disabilities away. The goal of this manual is to increase the number of school buildings that enable all students to enter through the same door, attend the same classes, and navigate the same halls side by side.

Many of the entrance and exit recommendations identified during the project's second study of special schools mirrored the findings from the initial investigation of inclusion schools. However, since entrances and exits are the pedestrian's introduction to the building and set the tone for the school, they are being repeated in this manual as well. These recommendations are supplemented by additional considerations that emerged from the more recent analyses.

The first point to be emphasized is that a welcoming building provides a main entrance that can be used by all of the building occupants and all of their guests. There should be no separate "handicapped" entrance. If the entry to the school building facilitates the inclusion of students with disabilities, this is an important sign that the interior of the building will also be responsive to the needs of all users, whether they happen to have disabilities or not.

On grade entry can be used by all students

Vehicular Approach to the Building

Many of the parents that participated in the study were not as familiar with the school building as the respondents who spent their entire day there. However, nearly all of the parents were familiar with the vehicular approach to the building and they had clear ideas about why it did or did not work. While principals and other administrators were well aware of the issues surrounding the site design and the vehicular access to the school building, parents were the most fervent respondents on this issue. Their recommendations and the authors' observations include:

- Multiple drop-off sites reduce both vehicular and pedestrian congestion.

- The drop off points for buses and private vehicles should be near the main student entrance to the school.

Another example of an on-grade entry that can be used by students

Site Plan

A. Parent Drop-Off
B. Covered Sidewalk
C. Main Lobby
D. Bus Drop-Off
E. Emergency Ambulance
   Access
F. Fence / Wall
G. Parking
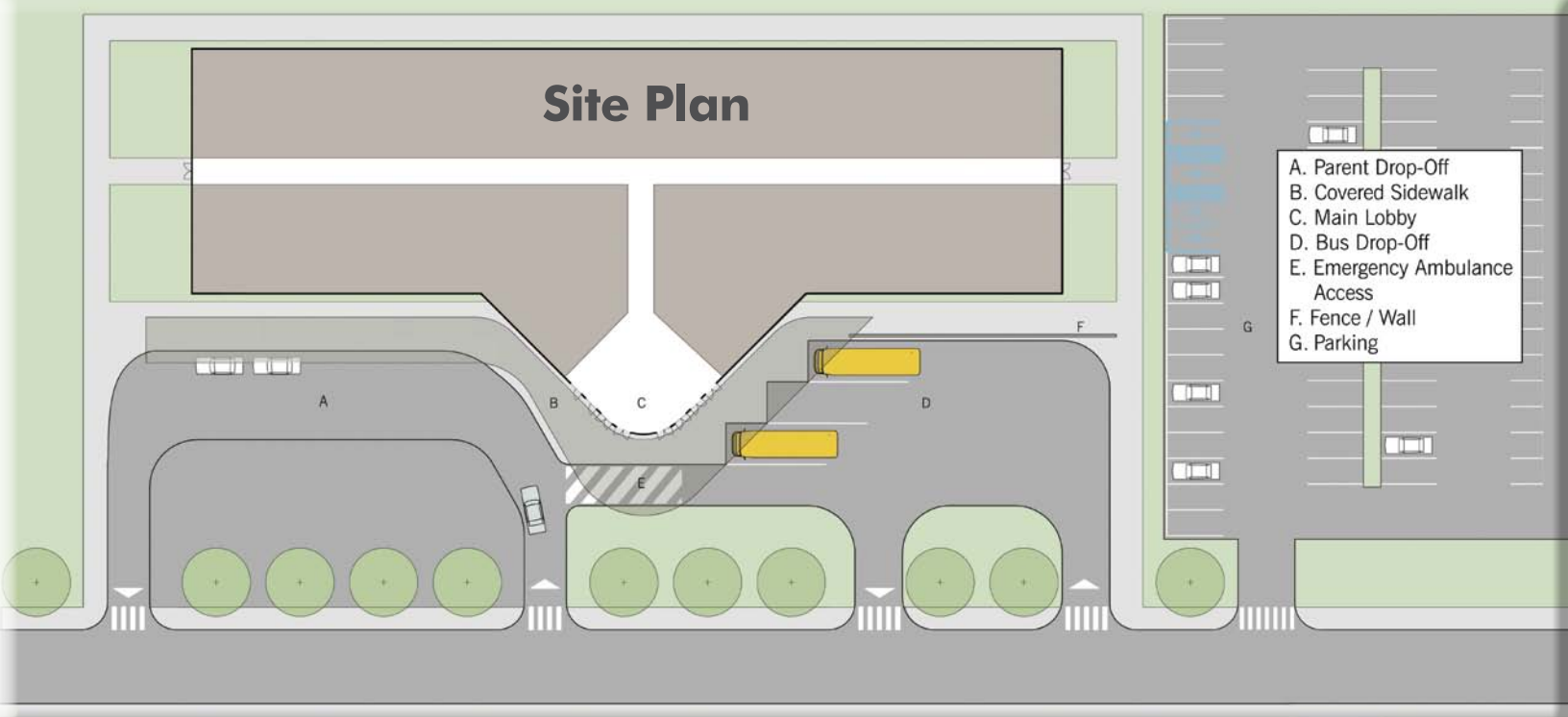
- The drop-off points for buses should be designed so that multiple buses can load/unload simultaneously, thereby reducing congestion and ensuring that buses waiting to load/unload are not backed up onto the municipal street.

- Having separate bus and car driveways also reduces congestion. Having a driveway/drop-off area that allows passenger vans and automobiles to drop off students simultaneously reduces congestion (since all students generally arrive at school around the same time).

- Try to provide sufficient numbers of van-accessible parking spaces and handicapped parking spaces close to the main entrance. This is especially important when the students are young children and parents or caregivers want to park and accompany their children into the building.

- Of course, handicapped parking spaces should be as close to the entry door as possible.

- Any drop-off areas for students with disabilities should be integrated into the overall drop off areas for any student arriving by motor vehicle.

- The drop off area should have covered walkways that extend out past the curb so students-- with and without disabilities-- are protected from rain, ice and snow. This is particularly important for students who use mobility devices, such as wheelchairs, walkers, rollators, canes, crutches, etc.

- Students should not have to cross in front of or behind vehicles to get to/from their buses, or the parking lot.

Entrances and Exits

The design of entrances cannot be discussed without also talking about security. Most school entrances are monitored by security personnel or by receptionists who unlock doors remotely for visitors. Consequently, recommendations focus on both accessibility and security:

- If the building contains wings or pods with separate entrances, highlighting the main entry door with design features that clearly indicate its centrality will improve wayfinding. Differentiation of separate sections, wings or pods with color or materials also helps with wayfinding and orientation.

- If an on-grade entrance is impossible, try to provide a choice of ramps or steps to access the building. Some people have a difficult time walking the longer distance that a ramp necessitates and find it easier to climb steps. For people who use wheelchairs and scooters, steps are a barrier and ramps are essential.

- If ramps are necessary to access the entrance, they should be an integral part of the design whenever possible, integrated as sculptural elements rather than looking like awkward appendages. Ideally, ramps should provide an adjacent alternative to steps that is equally convenient for users. This can be challenging when ramps are added to older buildings. Try to think and design in terms of integration rather than simple addition.

- In order to avoid stigmatizing students with disabilities, all students should be able to use the same means of egress and every entry/exit should be accessible. In older schools, designs often give some students (usually those without orthopedic disabilities) easy means of egress, while forcing students who need an accessible entry to use a round-about route. In addition to further inconveniencing those who are likely to be challenged by their physical limitations, any design that forces people to sort themselves according to whether or not they have a disability serves to stigmatize and draw attention to the minority group.

- When renovating an older school where it is not feasible to make every entrance accessible, create an accessible main entrance that all students can use.

- If a student does not use the same entrance as their peers, this should be because it is the student's choice to enter the building privately and avoid the bustle and commotion of the main student body. In our research, entering privately and proceeding directly to the classroom was an option that students with autism spectrum disorders and mental health issues sometimes preferred until they got acclimated to the school. Classrooms on the ground floor with exterior doors are one solution for students who feel uncomfortable in crowds.

- Wide doorways with doors that open electronically or automatically should be provided. It is usually impossible for people in wheelchairs and difficult for people who use less restrictive mobility devices to manually open a side-hinged door.

- A sensor device on automatically opening doors helps prevent doors from closing on people who need extra time to get through the doorway.

- Avoid center door frames on double doors since they obstruct the clear opening of the doorway.

- Manual doors that are not too heavy to pull open enable students with disabilities that cause hypotonia or low

Fish tank in large lobby is a wayfinding aid

Outdoor spaces allows for socialization among high school students

muscle tone (such as Down syndrome), or students who are weakened by illness or medical treatment (such as chemotherapy) to open doors on their own.

- Large lobbies where classes and other groups can congregate and where there is room for a security/sign-in desk are helpful. This prevents congestion at the front door and makes for a safer

environment for people who have balance or stability issues.

- Avoid, as much as possible, major changes in light levels between exterior and interior spaces at doorways. For students with low vision, abrupt changes in light levels may temporarily blind them and be difficult to adjust to, putting them at increased risk of bumps and falls. Incremental changes are easier and will allow people with low-vision, any aging users, and other visitors time to adjust to different light levels.

- Most teachers who had ground floor classrooms with exterior doors liked this feature very much. Teachers said they were helpful and improved accessibility. They also made fire drills less onerous and overwhelming to students with disabilities – especially students with sensory issues who often find noise and activity overwhelming. However, classroom exterior doors need a locking system that the teacher controls and that cannot be accessed by students.

- Some schools in the study had small yards, courtyards and/or greenhouses accessed from the classroom which teachers used for recreation and for outdoor

lessons. Teachers appreciated this design feature because it allowed students to play, socialize and learn in a protected, contained space. However, they did suggest that it would be helpful if the space also had outside access (via a locked door or high gate) so gardening supplies, etc. could be delivered to the area without having to carry large items through the entire school.

- For older students furnishing this adjacent outdoor space with benches, and wheelchair accessible tables, facilitates informal socialization.

The following security recommendations are not directly related to inclusion, but should be considered simultaneously:

- Two sets of doors at the entry, with a vestibule where people can wait while being buzzed in, provides a space where people can be seen before being admitted to the building.

- A magnetized swipe pad or a key pad allows people to gain access without being screened.

Large lobby allows students to congregate with minimal congestion

- Plans/layouts where the office is visible from the front door and where there is a direct line of sight between the front door and the reception area/ office are helpful because:

    - It is easy to monitor who is entering and exiting the building.

    - The door can be kept locked for security, and people can be "buzzed in/out."

    - People entering the building who are unfamiliar with the school, can easily find the main office and reception area. This prevents visitors from wandering around the building while looking for the office.

The success of inclusive facility design, to a large extent, is dependent upon the design of the classroom. While nothing substitutes for competent professionals and para-professionals dedicated to making inclusive education work, their jobs can be assisted or undermined by the design, finishes and furniture of their classrooms. During the course of this research, in both inclusive schools and special schools, many teachers and their support staff were interviewed and observed in their classrooms. They identified several critical design features that can be used to support the education of students with a wide range of disabilities in both inclusive and special schools. These features include:

- Appropriate size and layout

- Flexibility in the use of the room

- Control of distractions

- Abundant storage space

- Appropriate equipment and technology

- Furniture that is:
  - well designed
  - appropriately-sized
  - sturdy
  - supportive of students with and without physical disabilities

- Heating, ventilation and air conditioning (HVAC) that regulates air temperature, humidity levels and air flow

- Adjustable lighting and good acoustics

- Appropriate flooring

Size

One of the most important design issues in any educational facility is the size of the classroom. The ideal size is a difficult dimension to capture as it is a function of a range of variables such as:

A. The number of students, teachers and paraprofessionals using the room.

A typical ratio in special schools was one adult for every two students. In one special school visited, a classroom for six students and four adults was 30 feet by 25.5 feet (765 square feet) and this was considered adequate. In another, the ideal for nine students and five adults was 34 feet by 30 feet (1020 square feet) and a third was 32 feet by 25 feet (800 square feet).

B. The function of the room:

Is it:

- A typical core curriculum classroom?

- A laboratory which should have space for lab work and for whole class lectures?

- An enrichment space, such as the art or music room, where extra space is needed for supplies, equipment, storage, instruments, etc.?

- A life skills room where there are special areas for teaching food preparation, personal hygiene, career training, etc.?

C. The type of disability:

A major size concern in both inclusive and special schools focuses on students using scooters, power or manual wheelchairs, or walkers, and their need to navigate the classroom. The ability to create this space is a function not only of square footage but also of:

- Adequate storage that does not compromise wheelchair accessibility.

Exterior door allows supplies to be brought in directly

- Furniture that can be easily moved to create maneuvering spaces and access to student work areas.

- The amount of equipment and technology that occupies floor space (Screens with ceiling mounted projectors and smart boards mounted onto walls are two effective ways to create more space in the classroom.)

Greenhouse provides opportunity for horticultural learning

One special education teacher recommended that the classroom be large enough for a swing to provide sensory stimulation for students who need it. (While this might be appropriate for special schools and self-contained classrooms, it could prove problematic in an inclusive classroom, as swings are likely to prove a tempting distraction.) For younger students who find it difficult to sit still, room is needed for movement.

D. Room for older students: "big kids need big space"

As students age, they become bigger and their mobility equipment and personal space needs multiply the area of the space that students with disabilities require. When students reached upper, middle and high schools, the classroom size that worked for younger, smaller students became inadequate. When planning a school, factor in the anticipated age and size of the students when allocating space. In existing schools, the largest rooms should go to the oldest students and modifications may still be needed to provide classrooms large enough for students, their equipment and their aides.

Layout
General Considerations:

- The size and layout of the room should be large enough to accommodate various activities at the same time (reading, imaginative play, exercise, model building, full group discussion, etc.) as well as individualized learning situations.

- Students with disabilities are frequently coming and going from the classroom, because of their individual therapy and health needs. Consequently, movement within a poorly laid-out classroom can be unnecessarily disruptive. Attention to this issue, however, can alleviate this concern. When the door to the classroom is located at the front of the room, students with mobility devices and other conditions that require them to sit in front (for example, hearing and vision impairments) do not have to maneuver past rows of desks to get to their first row seats. Two doors from the hallway to the classroom alleviate congestion and increase maneuvering space, and draw less attention to movement in and out of the class.

Model Classroom

CLASSROOM
(approx. 32'x25')

SMALL GROUP INSTRUCTION ROOM

W.C.

B

OBSERVATION / SMALL GROUP INSTRUCTION ROOM

42-48" 24"

F E C D

A. Door to Exterior
B. Accessible Sink
C. Teacher Storage
D. Student Lockers
E. Mobility Device Storage
F. Corridor Door Alcove

CORRIDOR
(approx. 10'-14' in width)
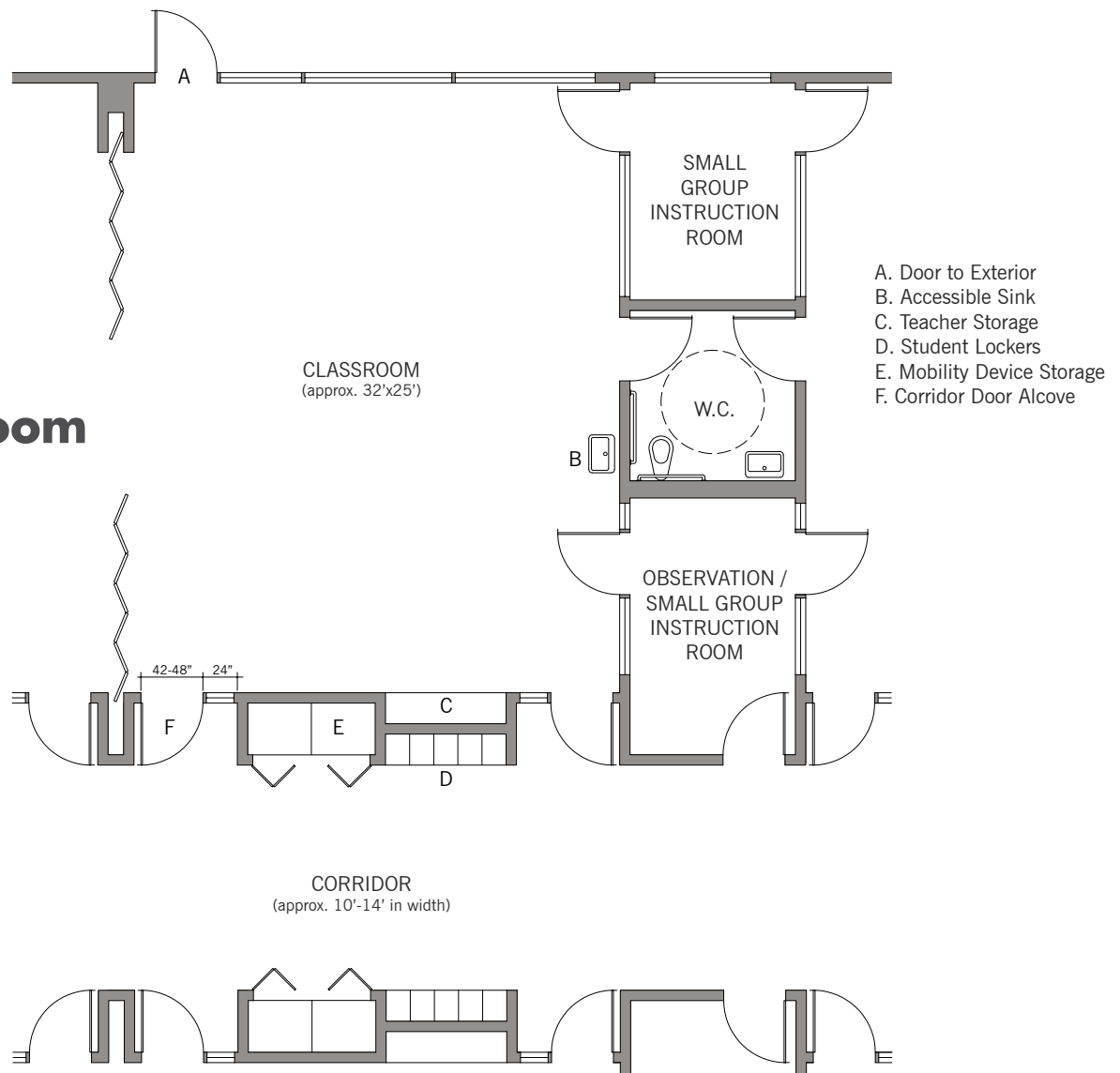
Flexibility in Layout

Teachers appreciate and benefit from the flexibility to arrange their classrooms in a way that compliments their teaching style. When teaching students with a range of intellectual abilities, it is important that the space be able to accommodate a similar range of activities occurring simultaneously.

Classroom that can be sub-divided increase functionality. Individualized learning necessitates that the classroom accommodates a variety of learning situations: full-class lessons, small group learning, one-on-one interaction, and individual work efforts.

Adjacent classrooms divided by a soundproof partition that can be opened to double the size of the space and allow two classes to participate in a joint activity is one way to increase the flexibility of the space. If you opt for this design, the importance of good soundproofing can not be over emphasized.

In one school we studied, partitions had been added to divide a large classroom into two smaller rooms that were used to give remedial help to students. The partitions ended two feet below the ceiling, and everyone could hear what was going on in the adjoining room. This was distracting to teachers and students alike. Students in need of remedial help are likely to have attention deficit disorders and the noise distraction compounds their ability to take advantage of the instruction being offered.

As an example, one inclusive school in this study included a self-contained classroom that was actually two adjoining rooms. Students and staff flowed back and forth between the two rooms as the need or curriculum dictated. When only one of the rooms was occupied, this design also allowed the teacher to move the entire class into the next room to separate a student who was experiencing serious behavioral issues and needed privacy to recover. As one teacher commented: "It's good to have a space that can be set off for students when there is a behavioral problem." As a less costly alternative to a partition wall, a door between adjacent rooms allows students to access both spaces without exiting to the hallway, and gives teachers ready access to staff in the adjoining classroom in an emergency situation.

Teachers and administrators were extremely clever in creating and utilizing classroom flexibility. Temporary sub-areas were created in the classroom for individual and small group activities in a variety of ways:

- Gym/floor mats were placed on their edges to act as low walls so that smaller, visually private spaces could be created while still allowing a standing teacher to glance over the mat and observe the student.

- Rolling cloth partitions and fabric covered partitions on wheels were used to separate areas and give visual privacy.

- Pull curtains on rods gave visual separation from floor to ceiling.

- Folding fabric covered partitions provide visual privacy and can also be used to mount written reminders, instructions, student work and other lightweight objects.

- Furniture (bookshelves, storage closet, cabinets, etc.) can be arranged to create sub-areas. Wheels installed on the bottom of the furniture facilitate rearrangement and help preserve floor finishes.

- Large pieces of cardboard created a semi-enclosed space around students doing individual activities.

Separate lab and lecture areas provide space for two activities

Ability to subdivide classroom with furniture

Observation Space

Students sometimes need to be observed in the classroom to identify problems and progress. Observers may include parents, student teachers, and professionals who must observe and document classroom performance. Teachers consistently reported that it is disruptive for both the student being observed and his/her classmates to

One-way window allows monitoring without disrupting the class

have parents and other interested parties come into the classroom to observe. Two suggested solutions to this problem were:

- An observation room entered from the hallway and located between two classrooms. One way windows allow observers to view the classroom without posing a distraction to students.

If doors to each of the two classrooms are added, flexibility is increased and these spaces can double as pull-out rooms for individual, one-on-one, or small group activities when they are not being used for observation. Furnishings that may facilitate room use include some seating, a small table and blinds for the one-way windows.

- A one-way window looking into the classroom from the hallway is a less costly alternative. In this case, blinds to close off the window when observations are not being conducted are essential.

Lighting

Lighting is a key element in any environment, and particularly in learning settings. Consequently, lighting issues were a particular focus in the current classroom analysis. Some illumination considerations that emerged included:

- Lighting levels need to be controlled from within the classroom. Both natural and artificial light levels need to be controllable and adjustable. For example, too much daylight can make the room too bright when projecting images onto

a screen. Windows need shades that can be drawn to decrease glare but still allow light to penetrate.

- One school had "daylight harvest" lighting in classrooms. With this feature, artificial light is automatically regulated as a function of the amount of natural light coming into the classroom at any one time. (The artificial lights came on when the natural light levels were too low.)

- When the front of the classroom is especially well lighted, students with vision impairments can see the teacher and the board and students with hearing impairments can see signers and interpret sign language without strain.

- Fluorescent lighting that flickers, hums or buzzes easily becomes distracting and irritating, particularly to students with autism spectrum disorders who are likely to be especially sensitive to sensory stimuli. These phenomena can trigger seizures in students with epilepsy or other brain injuries.

- The best classroom lighting is both zoned and dimmable. Zoned lighting helps to focus students' attention to a specific area of the room, and allows the teacher to use lighting to help modify behaviors. For example, being in an area where the lighting is

dimmed may help to calm an agitated student. It also allows teachers flexibility in terms of activities. Students in one area can view visual media without glare, while others create visual artwork in a well-lit space. Visual impairments differ and some students may work best with high light levels, while others from dimmed lighting. Flexible, zoned lights accommodate these differing needs.

Classroom with good lighting and layered white board

Indirect lighting reduces glare

- Task lighting that can be regulated in intensity and moved from one area to another increases the flexibility of the space and can be particularly helpful to people with vision impairments.

- Recessed and indirect lighting help to minimize glare. Glare is not only a distraction, but also can impair the vision of everyone – even those without visual impairments. It tends to reduce contrast and cause a blinding effect. For this reason, design features with the potential

Multiple switches provide lighting flexibility

to increase glare should be kept to a minimum. These features include direct lighting and reflective (usually smooth and polished) surfaces. Light diffusers and light absorbent surfaces reduce glare. In one school we studied, teachers hung cloth diffusers over florescent ceiling lights.

- Lights that are connected to motion sensors save energy but can be distracting when they go on or off unexpectedly. It also becomes annoying when someone is in the classroom but not moving around and the lights suddenly turn off. For these reasons, motion sensors are best when they include an on/off switch that can override the sensor.

- When the lights are all turned on to their highest setting, there should be uniform light levels throughout the room.

Furniture

Sensitively designed furniture is also a critical classroom requirement. Furniture issues and recommendations that emerged from the research included:

- Select individual desks with unattached chairs. It is often difficult or impossible for students with mobility or orthopedic disabilities to climb into a chair that is attached to a desk. Desks and chairs that are attached set limits on the students who can fit into the space between them. Children who are small for their age may have trouble reaching and using the desktop. Students who are tall, obese or pregnant may be cramped by the allotted space.

- Desks need portability. Teachers want to be able to group them together for both small group and large group activities. An aide may want to work individually with a student whose pace differs from that of the class. One student may need to help another student who has been absent from class to catch up on the work he/she missed. Students collaborating on projects need proximity. Teachers may want to move some students to a location where they can be closely monitored. When classroom furnishings limit flexibility, the ability to teach and to learn is also curtailed.

Beanbag chair and traditional desk and chair provide seating choices

Desks with unattached seating allow accessibility

- Rugs with patterns can be used for games with younger children, or as a diagram to position students when they sit on the floor. For example, a pattern containing a grid or other defined areas can be used to differentiate a distinct place for each child to sit. This helps to define their personal space. It precludes disputes over who sits where and can keep children from leaning into each other.

Horseshoe shaped table allows teacher ready access to a group of students

Desks that can be configured in a variety of ways provide flexibility

Broken chair illustrates the need for strong furniture

- Chairs should be very strong, especially for larger and/or older students. Students may also rock so a slight give in the back of the chair might be comforting for them.

- If students are using laptops, they need desks large enough to accommodate both the laptops and textbooks, workbooks and other non-electronic study materials.

- Students with large communication devices will require a larger desktop.

- Larger students need larger, sturdier furniture.

- Students in wheelchairs may need adjustable height desks and tables.

- Desks and tables should also be weight bearing for students who need to support themselves on the top surface when getting up or pushing away from the table.

- Chairs and tables that glide easily along the floor making minimal or no noise were strongly preferred by both teachers and students. Noise from a sliding chair is distracting for all students but particularly for those with cochlear implants. (Many teachers placed tennis balls on the bottom of table and chair legs to dampen the noise.)

- When chairs glide easily along the floor without having to be lifted up it makes it easier for teachers to help students who need assistance pulling their chairs closer to or away from a table or desk.

- For students with orthopedic disabilities, individual desks work more effectively than shared larger tables because they can be adapted to meet each student's needs. The seat arrangement also helps with the proper positioning of the student. Seating should be geared to individual students based upon the bodily position where they perform best. While many students with orthopedic impairments require wheelchairs for mobility, they often use stationary seating for classroom-based work. This may include a variety of specialized chairs/seating to position their bodies in ways that promote proper bone growth and positioning.

- The amount and variety of furniture needed for students with disabilities necessitates proximate, accessible storage. Most special schools had huge inventories of custom furniture and equipment that was not currently in use. This furniture is only as good as the inventory system that organizes it. If it is hard to get to, it is likely to remain in storage.

- Wheelchairs, standers and other equipment are all different heights, although these heights may be adjustable. High, low, wheelchair accessible tables may all be needed. In addition to specialized seating, adaptive cushions and wedges are frequently used. Many special needs classrooms include beanbag chairs.

- Some students may need arm rests for balance.

- Students who bang their heads will need a desk or table with a padded or soft surface secured to the top.

- Floor surfaces can be enhanced, especially for crawlers, with activity mats, molded soft floor coverings, or interlocking foam pads that look like large jigsaw puzzle pieces.

Amenities

- Sinks are desirable in all classrooms but they should be placed in an alcove so they are not protruding from a wall where someone can bump into them. On the other hand, sinks that can be approached from three to four sides and are mounted on pedestals are more accessible to students using mobility devices.

Classroom sinks with 2 faucet types

Sink accessible on three sides

Classroom sink with controls on side and picture cues

- Anti-scalding devices are recommended for all sinks, along with lever handle faucets that clearly indicate hot and cold areas in both color and words.

- In one school the researchers noted that the faucets were located on the side of the sink, not the back. This is good for accessibility but in some installations the hot water faucet was closer to the outside edge of the sink. This created a potential safety problem as it was easy to bump into the lever faucet and turn it on. Also, since it was the closest, it was easier to reach and may have been used more frequently for this reason. The cold water faucet should always be the one closer to where the user will be standing or sitting in a wheelchair.

- Wheelchair accessible drinking fountains are also a desirable amenity in all classrooms, especially for students who have to take medications. A cup dispenser near the water allows students to use cups to take pills.

Equipment and Technology

During the tours of both inclusive and special schools, staff repeatedly emphasized the critical role that special equipment and technology plays for ALL students but especially for those with disabilities. Consider the following when equipping a classroom:

- Teachers and students both loved smart boards. The teacher can write on them and still face the classroom and students can touch and move words and objects, interacting with the images on the screen.

- Many students with disabilities benefit from adaptive equipment. Examples include:

-Switches
-Touch screen computers
-Slant boards
-Light boxes
-Push and turn tables
-Picture communication books
-A small typewriter for students who cannot write. It exports the

typed words to a computer which in turn prints them out.
-Spinners
-Adaptive keyboards
-Interface boxes that adapt
-Audio boxes
-Overhead projectors
-Adaptive utensils

Examples of student equipment in classroom

- Computer rooms have outlets on the floor which limit their placement and requires considerable bending over to reach them. Some teachers expressed a preference for outlets suspended from the ceiling.

- Computer access is essential for students who can use them (although one teacher cautioned that computer screen projections can lead to seizures for some students who have a tendency to experience them). Computer programs can enable non-verbal

students to communicate. One student used eye movements to manipulate the computer mouse and was working to communicate using this method.

- One school preferred a computer program called "Jump Start" – a collection of computer learning games to teach fundamental math, science, reading and art skills to students in grades pre-k through five. Another used a program called "Leap Frog" to help students with literacy. While computer programs are beyond the purview of this manual, the teachers that used these programs felt they worked well.

- Some schools keep a sample power chair or other mobility device that a student currently using a manual chair can try out to determine if he/she has the capability/potential to drive a power driven device.

Distractions

The researchers found in their first analysis of inclusive schools that distractions in the classroom are a major concern for typical students and, to an even greater extent, students with learning impairments, attention deficit disorders, and behavioral and intellectual issues. This finding has been prevalent throughout our school research. Distractions originate from a wide spectrum of visual and auditory stimuli. Strategies for reducing distractions include:

- Whenever possible, locate classrooms and therapy spaces away from vertical circulation paths. Students generate a significant amount of noise when they use the stairs and the elevators.

Mat used to partition off desk, limiting distractions

Partitioning around desk decreases distractions
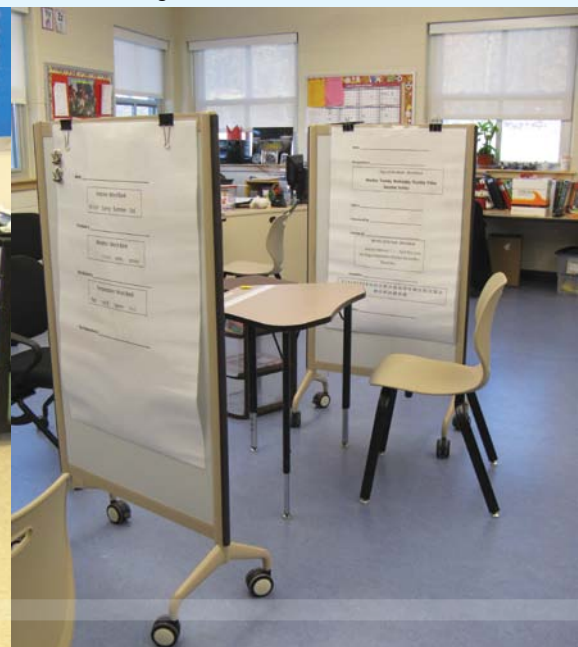
- Materials should be kept in closed storage areas to decrease clutter, manage visual stimulation and to allow the teacher to control access to supplies and materials. Students with limited attention spans or focusing difficulties see these materials and want to use them rather than those designated for the current lesson.

- Window coverings and tinted glass can be used to reduce glare.

- Shades also limit visual access to potential distractions that are occurring outside the classroom. (An outdoor gym class, sports, playground activity, lawn cutting, traffic and other street activities can all be diversions from the subjects being taught.)

- Some teachers particularly liked the idea of blinds located between two panes of glass so students can not play with the cords, and blinds remain free of dust and grime. (On the other hand if these blinds break, they cannot be as easily repaired or replaced.)

- As discussed in classroom layout, partitions between desks or small groups of desks can be used to block out visual distractions from the classroom for students who are working individually or in small groups.

- Effective soundproofing can also be used to deaden noise from the hallway and neighboring classrooms or other activity areas.

- Building layouts should be planned so that noisy activities (the gym, band room, music room, cafeteria, etc.) are separated from quiet rooms such as classrooms, the library, speech therapy areas, resource rooms, etc.

- Reflective light can be a problem not only because it creates glare but also because it can obscure the view of the front of the room. This is particularly problematic for students who need aided language stimulation (ALS) and sign language.

- Bright lights can be distracting to students. As mentioned, one school placed colorful diffusers over the hard acrylic covers on florescent lights. This reduced the harsh glare and creating a more soothing atmosphere.

Creative intervention reduces glare and harshness of fluorescent lights

Acoustics

- By distributing the teacher's voice evenly throughout the room, speaker amplifying systems are good for all students, and especially for those with hearing and attention deficits. They also benefit teachers by placing less strain on their vocal cords. However, when using any amplification system, good sound insulation is essential between rooms so sound in one room cannot be heard in adjacent rooms. (Caution: One teacher described an FM system that she did not like because the students looked at the speaker, the origin of the sound, and not at her. If using an amplification system, be certain the sound is broadcast throughout the room from multiple sources.)

- When sound absorbent materials are used in classroom surfaces, this helps prevent even slight noises from bothering students with sensory-auditory processing disorders. Materials with good acoustical properties will also filter out noise from hallways, which can be quite distracting.

Classroom Storage

Storage concerns were universal in all of the schools analyzed for this project, whether they were special schools or inclusive schools. Storage considerations fell into two categories: teacher storage for equipment and supplies and student storage for their belongings.

In all but the newest schools, storage space was inadequate. And while storage space is an issue in most schools, it is particularly important in classrooms where there are students with disabilities as they often have multiple pieces of equipment and supplies. Some examples include:

- Students with serious orthopedic disabilities may have multiple pieces of mobility and positioning equipment, such as strollers, walkers, gait trainers, standers, adaptive chairs, different types of wheelchairs, etc. All of these items may be regularly moved and shuffled around the room or they need to be stored nearby for easy access when needed. Most of these items take up a fair amount of space (one parent described it as, "roughly the size of a washing machine") and can be obstacles for anyone

Storage closet holds variety of materials and equipment

in the classroom. Storage needs to be given extra consideration in any classroom where there are students with disabilities. Having a storage space that is accessible from both the classroom and the hallway provides flexibility, since walking through the classroom to get to the equipment can be avoided.

- Depending upon the age and needs of the student, items requiring storage might include: braces, communication devices, orthotics, vests, light boxes, tape players, special blocks, different shoes for different activities, dietary supplements, a change of clothing, diapers and wipes, as well as the

usual back packs, books and outer wear. The nurses' office is sometimes used for storage of items that are considered medical needs as well as for medications.

Types of storage needed:

A. Student Storage

- Alcove or closet for mobility equipment, as mentioned above.

- Students with disabilities tend to do better with cubbies than with lockers, which can be difficult to open for persons with intellectual, motor and orthopedic challenges.

Classroom lockable storage

- There was no consensus among interviewees about whether or not cubbies should be open. In the pro camp, teachers endorsed the idea of the open storage so students can see and find their belongings easily. This arrangement can develop a sense of caring for belongings and self help skills.

- On the con side, some teachers felt that open cubbies were a distraction for students with focus difficulties or that the students just pull items out at random.

B. Teacher Storage

- Some teacher storage should be closed so it does not distract the student.

- Teachers liked the idea of larger storage bins or shelves rather than smaller ones because it is easier to store larger pieces of equipment, supplies, games, students' art work, etc. (At one site, a teacher showed her closed storage units and then described how they were impractical because they were too small – each cabinet was about 2-2.5 feet wide and 2 feet high.)

- Storage units should have shelves that can be adjusted.

Mobility Device Storage
Accessible from Corridor
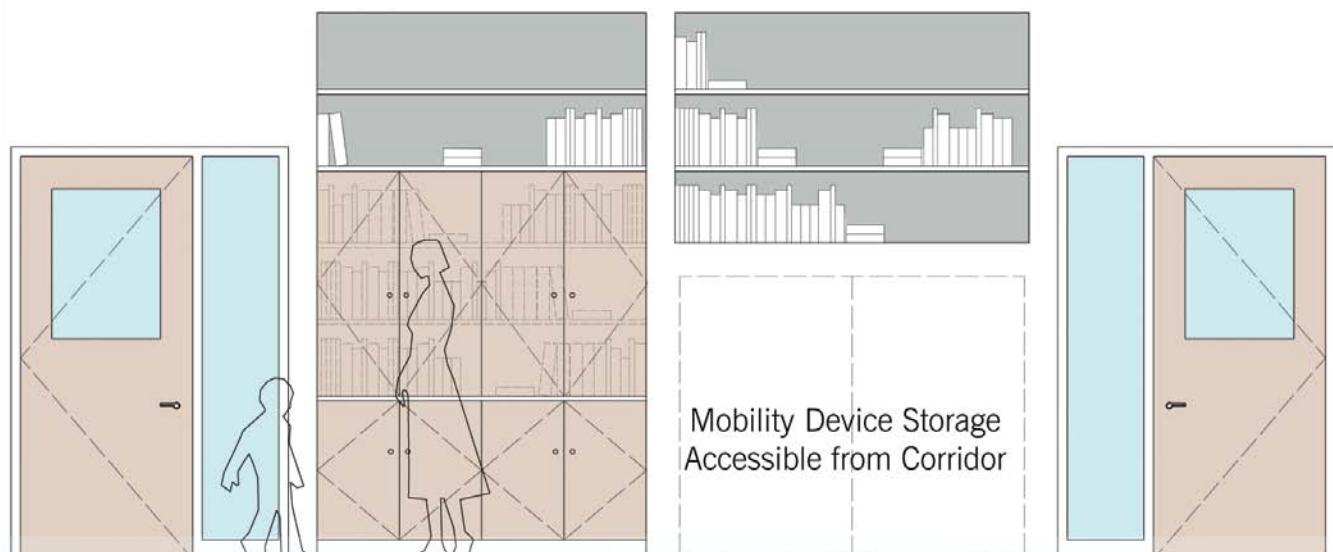
- Teacher storage units should also have locks so valuable pieces of equipment, such as audio-visual aides, can be secured.

- Hooks on walls can be useful for hanging things so they are in sight and easy to get but are out of the way.

- A shallow closet so students can see and choose objects to work with (books, games, puzzles, etc.) can also be helpful (but there should be a door with a lock so it can be closed off when not in use).

Flooring

The main issue discussed concerning flooring focused on carpeting. Carpeting has some advantages. It cushions a fall and is softer to sit on. It also absorbs sound and makes the room more quiet. The general consensus among staff was that carpeting was not a good choice for the classroom because:

- Carpeting is harder to roll a wheelchair on or glide a walker across than tile.

- Germs cling to it.

- It holds dust so it is bad for students with allergies, asthma and other respiratory ailments.

- Carpeting is difficult to keep clean. (It tracks dirt and mold, while spills, vomit, toileting accidents, and body fluids all create stains.)

Basically, a firm but soft floor – a material with some give or cushioning – that can be washed every day and has some sound absorbing quality is the ideal flooring solution.

Many teachers had resilient flooring but used an area rug for the children to sit on that could be cleaned easily.

For younger children, the area rug should have pictures of animals or the alphabet on it so the carpet is more appealing and can be used as a teaching vehicle.

Open storage for students and closed storage for teacher

Overhead storage gets large equipment out of the way

Color coded hallways help with wayfinding

3. Circulation

Sensitively designed circulation space is an important design feature. The following general design tips for inclusion emerged from the current research:

- Sharp color contrast between walls and floors assists students with visual and intellectual disabilities to define more clearly where the floor ends and the wall begins.

- Color coordination or color zones will define halls and wings of the school and help with orientation/wayfinding, as will landmarking cues such as sculpture, displays, and changes in wall materials.

Hallway Landmark Mural

- Insetting a different design into the floor at each hallway intersection can also assist with orientation.

- Keep all floors the same level. If ramps are necessary, have the ramp floor a different color than the main floor (also install an anti-skid floor surface) to call attention to the change in floor level. Make sure there is a handrail on both sides of the ramp.

- Carve out space for storing mobility equipment out of the circulation path but adjacent to the classroom, as described in the Classroom section. This will create more circulation space and prevent students from tripping over or crashing into the equipment.

- If there is a major activity area along the hall, such as a gym or a swimming pool, try to block visual access to it (especially a swimming pool) so the space does not distract students with focus problems.

- Make sure hallways are wide enough. (An ideal would be a 14-16 feet width if there are lockers along the wall). There should be sufficient room for the general student body to move smoothly through the hall in both directions.

In addition, students with mobility and sensory disabilities should be able to navigate the halls with their peers without being jostled, pushed, or knocked over.

- If lockers are not lining the hallways, install hand rails on both sides of the hall to help persons with visual problems "track" their way with their hands for guidance. For those with mobility problems, handrails can also be used to help the students pull their way along the hall in their wheelchairs or to hold onto for steadying themselves if they are ambulating with difficulty.

- Install kick plates along the bottom of the walls so visually impaired students can tap their canes against them to help them guide their way.

- Some teachers recommended a color strip down the center of the hall floor to help guide students to walk on one side of the hall. Another recommendation was to bisect the hall floor visually with color to help guide sight impaired students down the corridor. (This technique may also keep students traveling in the same direction to one side of the hall. East and west bound groups or north and south bound clusters will have their designated side to walk on.)

Colored border defines edges of hallway floor

Wide hallway intersections decrease congestion and increase maneuverability

Two height water fountain creates access for all students

Wide recessed doorway allows safe entry into hall

Unrecessed door can open and hit passers-by
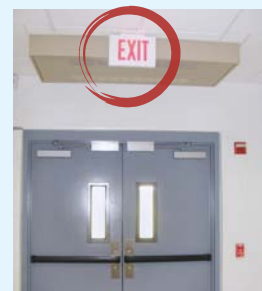
Heater at Exit

Ramp with different colored surfaces on flat and sloping sections

- Try to keep corridors a consistent width. When corridors constrict, they create bottlenecks when students are changing classes or arriving or departing and the halls are crowded. This is particularly important for students who are at risk for being jostled or knocked over.

- Install indirect light to decrease glare.

- To avoid collisions at intersections, angle corners so students and staff can see if anyone is heading toward the intersection from the perpendicular corridor.

- Install water fountains in these corner angled spaces so they do not protrude into the hallways. This eliminates obstacles for students with vision problems who might walk into the fountains. Install two different height fountains – one for ambulating students (or tall students) and one for students who are short or using wheelchairs.

- Inset entrances to classrooms as this helps alleviate congestion in the corridor and it helps visually impaired students to find the doorway with their canes.

Angled hall corners increase visibility
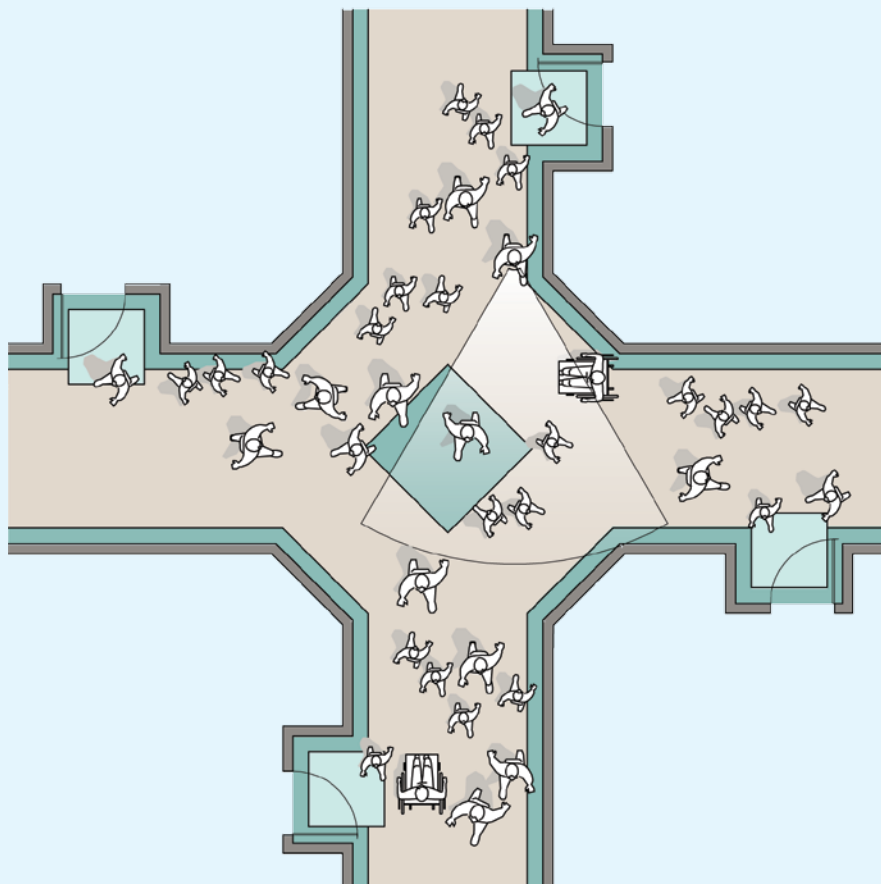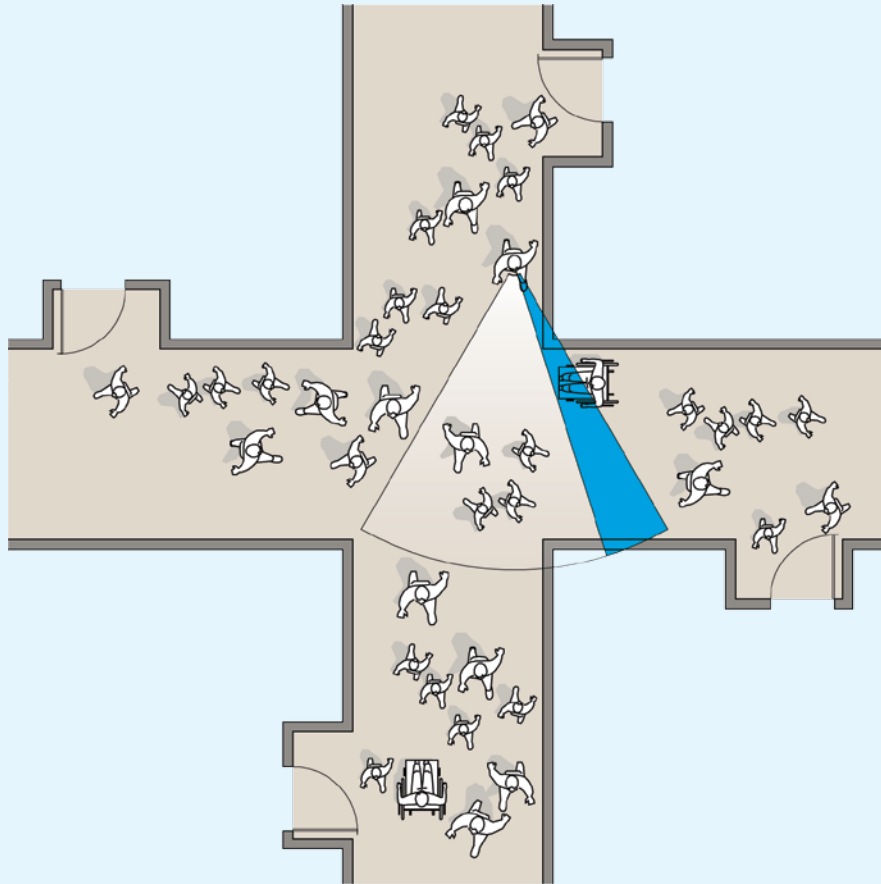
Lockers

- Typically designed lockers can create a problem for students with physical, sensory and intellectual disabilities. Some are too small and need to be wider. Students with mobility issues cannot easily place items into the lockers or reach the bottom or top of the locker.

- Some opening mechanisms are hard to use for those with hand motility problems as the catch has to be pushed up and then the door pulled out.

- For students with intellectual and visual difficulties, combination locks can be difficult to use as the numbers are small and the combinations easy to forget.

Railing down stairway center controls traffic, increases safety

Changes in Levels

Internal ramps

Ramps in halls when necessary can be quite therapeutic. They teach students how to walk uphill and to use ramps as they will have to do in the outside world. They can be very practical for real life training.

- As mentioned above, the flooring on the ramp should be a discernibly different color than the hall flooring to cue students that there is going to be a change in the level of the floor. (Going from a flat surface to an inclined one –or the reverse—can throw people off balance.)

- Internal ramps should have handrails on both sides at two different heights-- a lower height for small students and wheelchair users and a higher rail for other students who need them.

- If the ramp is long, flat resting places along the incline are required. The code specifies a resting area every thirty feet. A supplemental seat or bench would be a desirable addition to the code requirement for students who need to sit and rest while using the ramp.

Skylights bring in natural light

Skylight

2nd FLOOR

1st FLOOR
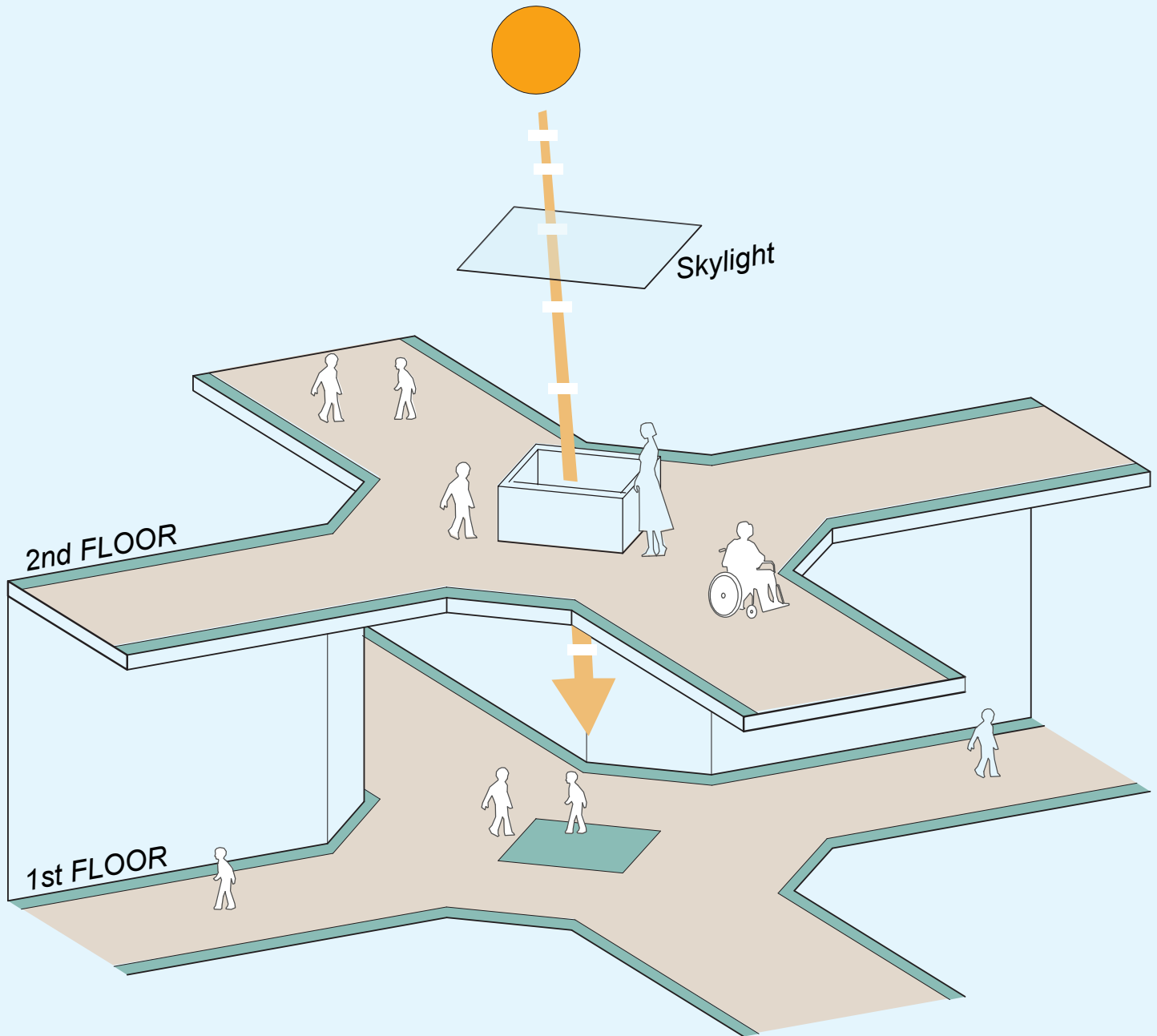
Stairs

Stairs, while generally detrimental to students with disabilities, can contribute to the education of students with certain challenges. For example, they can provide a practice tool for students with moderate mobility and sensory issues.

Some design recommendations for stairways include:

- Provide a sufficient amount of natural light.

- Again, have railing at two heights for students of different sizes.

- Place railings on both sides of the stairs.

- Mark the edge of each tread with an anti-skid strip that contrasts sharply in color to the rest of the tread. This will provide traction so the stair user does not trip or skid and it marks the edge of the step so the user knows when to step down or up. (This is particularly important for students with mobility and visual challenges.)

- Keep riser heights low and treads deep for students with mobility problems.

- Cover or paint the stair tread in a contrasting color to the riser.

- Paint stair treads different colors so they stand out. All of the steps may appear to visually blend together when someone with a sensory disability looks down a flight of stairs.

Elevators

- Elevators should be in a central location and easy to access. (The researchers saw one example where the elevator was located too close to a support column and this made it difficult to enter and exit the elevator in a wheelchair.)

- A back-up elevator is an excellent (but costly) recommendation.

- Locate the elevator near the stairs so students leave the departure floor and arrive on the destination floor at the same time as their class members.

- Several interviewees mentioned that a large elevator is desirable. This allows more than one student with a disability to use the elevator simultaneously with their aides. It also enables students with disabilities to ride up or down with friends, thereby increasing companionship while decreasing feelings of separateness and stigmatization.

In the elevator cab:

- Make sure the emergency call button is separate from the rest of the buttons so it does not get activated accidentally.

- Install the control and floor buttons at wheelchair heights.

- Have the floor buttons spaced apart from each other so students with hand and finger mobility impairments can touch the desired button easily. If the buttons are too close together, it is easy to hit several buttons simultaneously.

- Make the perimeter of the elevator floor a different color than the elevator wall and the floor so students with vision impairments know where the floor ends and the wall begins. (This will prevent them from accidentally walking into the wall.)

Wide hallway intersections decrease congestion and increase maneuverability

Bathrooms in both special and inclusion schools pose a particular challenge for students with orthopedic, visual, and intellectual disabilities. For students with orthopedic disabilities, the bathroom facilities should support ease of use, accessibility, independence and privacy. For students who are unable to toilet without assistance, the design should make it as easy as possible to provide this needed help.

For students with visual and intellectual disabilities, the bathroom should be easy to locate and understand how to operate its washing and toileting fixtures as well as easy to actually use them. Tours and interviews with teachers led to the following recommendation for bathroom design:

- Bathrooms in classrooms for students beyond first grade. This will increase their accessibility.

- Boys' bathrooms with urinals as well as toilets so students learn how to use both.

Accessible group sinks with sensor faucets

- Wide entry doors so students can come into and leave the bathroom at the same time (or separate entry and exit doors).

- A border on the floor in a contrasting color to the wall so low vision students can see where the floor ends and the wall begins.

- Decentralized bathrooms for older students. This recommendation came from a number of staff who wanted to move the bathrooms closer to the classrooms. Benefits to this design feature include:

- Fewer "accidents" by inclusion students who sometimes wait to the last minute to notify the teacher that they need to use the rest room.

- Less time spent out of the classroom by the student (and aide if assistance is required) by decreasing the amount of travel time to and from the bathroom. This is also beneficial for typically developing students.

- Increased privacy.

- As mentioned above, for students with intellectual disabilities, it should be clear how to use the bathroom fixtures and the fixtures themselves should be easy to operate for

students with orthopedic disabilities. Examples of fixtures that are easy to understand and use include:

- Lever handles (or a single blade lever handle) with clearly marked hot and cold points on the faucet, (or regions on the single blade faucet) that are double cued by color and text.

- Anti-scalding devices – a necessity.

- Faucets that do not require the student to push and hold down. Students with certain orthopedic and intellectual disabilities may be unable to perform this operation. Push faucets are not useful in learning how to wash hands as the student may not be able to push with one hand and wash both hands with only one free hand. The single blade lever or faucets on sensors work more effectively.

- A wheelchair accessible sink or an adjustable height sink in each bathroom.

- A fold down seat at one of the end sinks for students who have difficulty standing.

- Soap dispensers or hand dryers that can be used with one clenched hand.

Urinals at different heights increase accessibility

- Soap dispensers that are easy to reach (and are placed over the sink so that the soap does not go onto the floor making it slippery and harder to clean).

- Automatic toilet and urinal flushers.

- Toilet flushing handles that are a contrasting color (e.g., red) so they stand out and are highly visible for persons with visual and intellectual impairments.

- Towel dispensers that are easy to reach and use.

Single blade lever faucet provides label and color cues

- For students with intellectual disabilities, some of the bathrooms observed had different types of fixtures so students can learn how to use the variety of toilets, sinks and urinals that exist in the outside world. These should include:

- Urinals of different shapes and heights.

- Urinals that are flushed by sensors and urinals that are flushed by depressing a handle (the same applies to toilets).

- Privacy panels next to the urinals.

- Grab bars at urinals for students who need support.

- Sinks that are operated by sensor and by faucets.

- Sinks at different heights.

- Automatic hand driers and towel dispensers that release towels automatically as well as those that dispense manually when the user pulls the towel down.

- At least one stall in each bathroom large enough to accommodate oversize mobility devices as well as two people should the student require assistance inside the stall. (An individual, closed trash receptacle is also recommended for private disposal of personal items such as sanitary pads, tampons, betadine swabs, and urological catheters.)

- Child size toilets and sinks in the bathrooms adjacent to the lower grades.

- A larger stall to make it easier to potty train the child if it is not a one toilet bathroom.

- An enclosed shower and tub for students who have accidents (or have tub/shower rooms strategically located around the building).

Diaper Changing Area

Some students may use diapers. A changing table(s) should be located in the school in an easy-to-reach space(s). The authors are not sure the changing table should be in the general bathroom. This may embarrass students who need to be changed, as well as compromise their privacy. The changing area, wherever it is located, should:

- Be large enough for the student, his or her mobility device, and an aide or nurse to assist in the changing.

- Have an adjustable-height changing table.

- Be equipped with a shower with a hand held shower head to clean students who have had accidents.

- Have a shelf above the changing table so the aide/nurse can just reach up for diapers, wipes, etc. while still keeping one hand on the student so he/she does not roll off the table.

- Provide a closet for supply storage.

- Be equipped with a hand washing sink.

- Have storage for students' clothes in case of an accident.

- Make sure the changing room/shower room is warm as students will get cold with their clothes off. However, if radiators are used, do not place one directly next to the changing table (which the authors noted in one school) as the student could get burned.

Colorful flush handle is easily identified

Bathroom drain allows for easy clean-up

Shower in separate stall provides privacy for cleaning after an accident

These spaces are designed to teach basic living and vocational life skills to students with intellectual, physical and sensory disabilities. The researchers saw them in all special schools as well as in modified forms in inclusive schools. Life skills rooms should:

- Mimic a normal living environment.

- Simulate work spaces for students with disabilities who will seek employment in the future.

- Have distinct areas.

- Be as distraction free as possible – do not have a lot of things on the wall.

- Have good shades to block out distracting events occurring outside the school, etc.

Some standard life skills rooms include:

Kitchen

Life skills kitchens are demonstration kitchens where students can learn the basics of preparing food, cooking, setting the table, and cleaning up after a meal. (These areas already exist in many schools for "Foods and Nutrition" classes.)

These spaces should contain:

- A demonstration area where the teacher can lecture on food, nutrition and meal preparation.

- A marker board on the wall so the teacher can write down instructions and other lesson related information.

- Several kitchen demonstration areas so lessons can be given to small groups of students simultaneously (with some acoustical separation between sections).

Kitchen in lifeskills apartment with labels on cabinets

Two kitchens allow class to break up into small learning groups

- Sufficient room/work areas so different students can do a variety of tasks simultaneously.

- An island with numerous electrical outlets (that can be quickly shut off with a circuit breaker within easy reach of the teacher). An island allows staff to work at a central location and face the students and the equipment. Students can then see what is occurring – measuring and mixing of ingredients, solidifying and rising of ingredients, etc. The teacher should not have his/her back to the students while preparing or cooking the food.

- Sufficient room for seating around the island. A section of the island top (and counters) should be wheelchair accessible or adjustable height.

- A large enough island so teachers can give lectures to groups of students.

- Storage for food and cooking/ preparation equipment readily at hand (i.e.- in back of where the teacher is lecturing or demonstrating).

- Wheelchair accessible appliances, fixtures (cook top, sink, faucets, dishwasher, oven, microwave) and work areas .

- Stainless steel appliances that are easy to clean.

- Commercial size refrigeration and freezer compartments (walk in, if possible) for bulk food storage.

- Wall and under-counter cabinets that are accessible.

- C-pulls on drawers and doors.

- Lazy Susans in corner cabinets—both above and below the counter top.

- Wall cabinets lower than the standard.

- Pull-out storage units (with lips around the edge of the shelves so materials do not fall off).

- Labeled storage drawers and cabinets so students can find the proper utensils, ingredients, cooking vessels, small appliances, etc. on their own.

- Lever faucet(s) rather than sensors at the sink so students learn how to wash their hands at a regular sink.

- A maintenance closet for dry goods storage (paper towels, aluminum foil, canned good, cleaning materials, etc.)

Other kitchen options to consider:

- A commercial kitchen presents an opportunity to help prepare students for possible post-graduation employment in the food industry.

- In one special school, the researchers saw a mock "diner" where students learned how to take food orders, set a table, serve and clear food, etc. The diner simulates the outside world and can prepare the students for vocational activities when they graduate.

Bathroom

This space should simulate a typical residential bathroom so students can learn the basics of personal hygiene, clean the bathroom, and maneuver a mobility device or learn how to use the bathroom with another physical, sensory, or intellectual disability. Recommendations for this space(s) came primarily from teachers and included:

- A mirror, shelf and storage at the sink so students can learn the basics of self-grooming

- An accessible toilet (possibly elevated) with grab bars.

- A variety of faucets so students can learn how to use the range of faucets they will encounter in the outside world.

- An accessible bath tub/shower.

- Sufficient room at the side of the bathroom so a group of students can observe the lesson – however the square footage around the sink, tub and shower should be comparable to a normal residential bath so students can learn how to maneuver in limited space.

Laundry Area

- Install an accessible washer and dryer and a regular washer/dryer so students can learn how to use both.

- Again, build an observation area at the side so groups of students can watch the lesson.

Laundry room helps teach basic life skill

Bedroom

- This area should be equipped with a bed so students can learn how to make a bed and change bed linens. The room should allow the bed to be placed both against the wall and in the middle of the room so students learn how to perform tasks under both layouts.

- A bedside stand and dresser should be included in the bedroom so students learn how to reach and open drawers, etc.

- Two teaching clothes closets are ideal. One should be a standard closet and the other should have built-in, accessible shelves so students can learn how to reach or put away clothes under both conditions.

- As with the other spaces, there should be space off to the side large enough for a group of students to observe the lesson and then participate in it.

Vocational Training

For students with intellectual disabilities, the life skills curriculum will most likely include areas where students can learn vocational skills. These spaces generally include a clerical area and possibly a manufacturing area where students can learn how to sort, assemble, and package items. Teachers identified the following considerations for these spaces:

Simulated store teaches shopping

- Banks of computers in the clerical area.

- Large spaces so students have room to move around.

- Windows so students get used to working with distractions.

- Large surface areas for collating and assembling packets of information, etc.

- Labels on drawers so students can find needed items.

- A design where the teacher(s) can stand in the center of the room and observe the progress of students working along the perimeter at work stations.

- Good lighting—both ambient and task.

Lifeskills office promotes administrative and clerical skills **47**

Auditoriums

Auditoriums are important support spaces—both functionally and symbolically. They are places where the school assembles for lectures, special programs, and ceremonies, especially graduations.

Auditoriums are areas where students have the opportunity to get together with all of their peers – not just their class or grade level. Since they are semi-public spaces where all students co-mingle, they should be designed to include students with disabilities seamlessly – as full members of the school community with no stigma or overtly special accommodations that call attention to a student's impairment. Auditoriums should insure that students with disabilities can benefit fully from the myriad learning experiences and ceremonies held in this congregate space.

In addition, auditoriums are also spaces where parents and the outside community gather for special events. In many ways, they are the faces of the school to the outside world. And they should be designed appropriately so that they are fully available and send a message to all students and members of the community with disabilities that they are welcome.

- Auditoriums need accessible entrances and aisles (no stairs!) leading to seating areas that all students can use. (One of the newer schools visited in the first phase of this research had a separate sloping hallway outside the auditorium which led to the "designated section" of the room where wheelchair users were expected to sit and then go to the stage. This segregated students in wheelchairs on several levels: in their approach to the auditorium, in their seating location, and in their access to the stage.)

- The aisles should be wide enough for wheelchair passage (and ideally with enough room for one or two students to walk alongside the chair so the student with the disability does not have to wheel down the aisle alone when other students are in pairs). This allows the student to enter and leave with his/her class and increases feelings of connection to a larger group. The aisle should slope and there should be no steps.

Accessible Auditorium
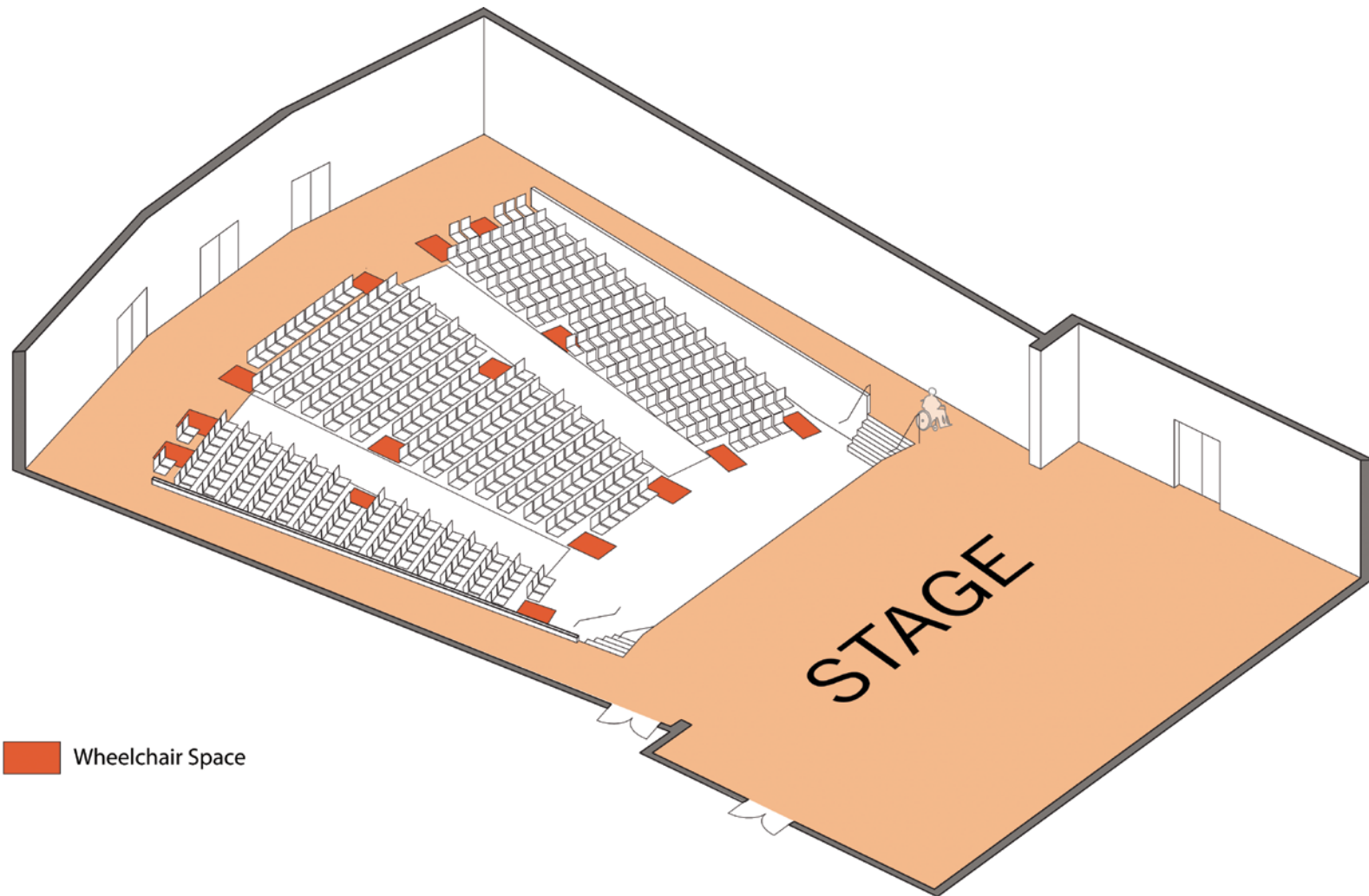
Wheelchair Space

- The ramp to the elevated stage should be the route that ALL students use to access both the front and the back sections of the stage.

- Level areas for wheelchair seating should be scattered throughout the auditorium so students in wheelchairs – or students who use rollators – can sit with their classmates. There should also be empty adjacent storage space for storing walkers, crutches and other mobility devices.

- There should be an accessible bathroom adjacent to and easily reached from the auditorium.

- Excellent acoustics are essential so sound does not echo or reverberate off the wall.

- A large drop-down monitor screen and sound system allows students with visual and hearing challenges, as well as those sitting in the rear seats, to see and hear the proceedings.

- A permanent public address system is recommended. Not being able to hear what is happening on the stage is a big concern for all students (and general auditorium users), but especially for the hearing impaired.

- Zoned or spot lighting by the front of the stage (or on it) is recommended. This will provide sufficient lighting so students with hearing loss can see interpreters.

- Students with hearing impairments may also need electrical outlets for plugging in their headphones.

- Any auditorium windows should be equipped with shades, blinds or another system for blocking natural light which can be distracting or make it difficult to see what is happening on the stage.

- The auditorium should also provide easily accessible (and locked) storage for audio-visual materials and equipment.

- Partitionable spaces increase flexibility by accommodating more than one activity simultaneously. Dividers that come down from the ceiling or curtains that completely close are recommended. Either solution should decrease distractions if the auditorium is also used as a gym or for physical therapy.

- Stationery chairs provide more structure and support than folding chairs, although spaces that double as gymnasiums or cafeterias have limited options.

- Floors and walls should have some "give" to help to cushion a fall or a collision for those with balance or gait issues. (This is also helpful for students involved in dance or gymnastic performances or who are required to run off stage during performances.)

- For safety, design a room with multiple accessible exits.

7. Gymnasiums

As in the authors' first analysis, the gymnasiums in this second study were multi-use spaces that catered to a wide range of indoor sports and physical activities. In some schools, the gymnasium also served as the school's auditorium. As reported in *A School for Everyone* (first volume) the study's observations and interviews indicated that design tips to support inclusive education included:

Padded walls and trusses decrease sports injuries

- Provide cushioned surfaces or surfaces with some "give" so that students who fall or collide into walls or other vertical surfaces will not get hurt. (Mats hung on walls can provide this cushion. If they are detachable, they can be used for yoga and other activities and are easily accessible when needed without having to be carried out from a closet.)

- Keep glare to a minimum by using matte surfaces and having indirect lighting when possible.

- Include a good sound system, preferably with a microphone for the instructor and speakers so that the teacher's voice is amplified above the other room noise.

- Basketball backboards should be an opaque surface that can easily be seen and that contrasts with the color of the net and rim.

- Keep space organized by having closets and other out-of-sight storage areas where equipment can be easily accessed but is not a distraction.

- Include extra storage for specialized equipment that students with disabilities may need.

- The gym should have movable partitions or dividers so more than one activity can take place simultaneously. (To do this effectively, the gym should be large.)

Additional gymnasium recommendations that emerged from the second study included the following:

- Consider using flooring that looks like wood but has a slight cushion to it. (One school used NORA Sport and liked it very much.)

- Wrap door frames in wall padding or other resilient material to soften the impact from a collision.

- Climbing walls were popular and good for all students, not only those with disabilities.

- Partitions in the gym can make it easier to have adaptive gym classes for students with unique needs and abilities, if necessary.

- Different types of equipment--- lower basketball hoops, etc—may be necessary so there is equipment available for all students.

Curtain divider allows for adaptive and simultaneous gym activities

Red basketball hoop stands out against white background

Zero entry pool facilitates access

All of the special education schools included rooms especially designated and designed for physical therapy (PT). While some schools, especially at the college and university level, include physical therapy rooms as part of the athletic facilities, most inclusive schools did not have a space set aside for this purpose.

In the schools in this study that did have purpose-designed physical therapy rooms, therapists, teachers and students offered suggestions for their functionality:

- PT rooms should be located near the gymnasium and other recreational spaces.

- Ceilings should include visible support beams with moveable rings or hooks to support hanging equipment such as swings, hammocks and trapezes.

- An office area with desks, computers and files should be located adjacent to but separate from the PT space, so that therapists have a quiet place to develop therapy plans and write student evaluations and notes.

- Too much open shelving and/or open storage is distracting to students.

- A large storage space or storage spaces should be available off the PT room so that large items, such as gross motor equipment, can be stored out of sight and in an organized way, so that the inventory can be easily accessed. Teachers and therapists don't use equipment that is stored in a place where it can't be easily seen/located and reached when needed.

- PT rooms, like classrooms, should be capable of being partitioned for use by more than one individual, and to insure that students have some privacy.

- A small room with a one-way window allows parents, therapists or aides to view the student's PT session to see progress, and/or learn how to administer therapeutic movements and exercises with the student, without distracting the student or therapist during the session.

- Lighting should, as in other spaces, be indirect, dimmable and on individual switches for separate areas. Therapists suggested having a large screen and computer/DVD player available to show audio-visual films, demos, and other educational materials to students.

- Most PT rooms had good sound absorbent material on walls and ceilings and mats or other soft materials on the floor. One room had carpet tiles, which the therapist liked because they were easy to replace, provided a soft surface and dampened noise.

- Therapists liked having an attached, accessible bathroom adjacent to the therapy room, and stressed the need for cabinets and other readily accessible storage in this bathroom.

- Physical Therapy and Occupational Therapy should each have separate designated spaces.

- Physical Therapy rooms should be large for groups activities such as yoga.

Desk area separate from therapy gym allow therapists to work privately

Physical therapy room includes many specialized pieces

In the inclusive schools we studied, cafeterias were often huge, and always noisy and active. After containing themselves in classroom lessons and activities, the cafeteria provides an outlet where students can let off steam, socialize and move freely about. Students compete for attention and popularity and the excitement is contagious. For students who are physically frail, cognitively slower or have sensitivities to noise, the cafeteria can easily be overwhelming. If there was one place in inclusive schools that students with disabilities tried to avoid, it was the cafeteria. When autistic students passed in the hall outside its doors, they covered their ears. Students with hearing impairments turned off their hearing aids. Special education teachers often elected to avoid having their classes eat in the cafeteria at all, and instead prepared and served lunch in the classroom. When special education classes in inclusive schools did go to the cafeteria, they sat together as a quiet enclave amid the uproar, trying to carve out a more peaceful oasis.

In some of the special education schools we visited, lunch was regularly served in the classroom, and classrooms were equipped with sinks, refrigerators, microwaves and cabinets to facilitate food service. Many special schools included cafeterias but they were very different from those in inclusive schools. The atmosphere was quieter, calmer and more orderly. Sound baffles lined the walls and ceilings of several special school cafeterias. In one school, soft music played in the background.

Many students with disabilities do not have the capability of carrying their own trays, and this fact seemed to eliminate some of the pandemonium we observed in typical school cafeterias. In both special schools and inclusive schools aides helped or served students who were not able to carry their plates while they used their mobility devices. In one special education school students who were able to help serve were assigned cafeteria responsibilities and assisted their physically impaired peers. This was dually effective in that students learned a valuable vocational skill at the same time that they facilitated their peers' dining experience. Everyone wasn't in line to help themselves. Reducing the number of people getting up and down from their seats, navigating through furniture-cluttered spaces while balancing trays of food, had a surprisingly calming and civilizing impact on the atmosphere of the cafeteria spaces we observed in special schools.

Aides often sat with students and helped them with their food which was sometimes served at tables instead of, or in addition to, cafeteria or buffet style. Tables were less likely to be the standard one-size-fits-all and chairs were spaced at intervals that left room for mobility devices and other seating geared to individual needs.

For those who ate in their classrooms, one teacher explained:

"Going to the cafeteria takes too long and disrupts the routine. We have to go during a set time period, prepare the students' food, change their seating and we don't have enough time. Some students finish eating before others even start eating and some are fed through a G-tube. Our kids don't really socialize at lunch – it would disrupt their eating. If you let them get up and do things, there's a behavioral component."

When teachers discussed the ideal design for cafeterias, they stressed:

- Multiple entrances to avoid bottlenecks.

- The humming of appliances can be disturbing to students with autism, so refrigerators and other electrical

Small round tables allow everyone to participate in conversation

equipment needs to be acoustically separated from the dining space.

- Some staff recommended partitioning the space with planters and other dividers to increase the intimacy of what can be a barn-like space. Generally, any design intervention that added civility and limited noise and fast-paced movement was beneficial to students with various disabilities.

- Smaller, round pedestal tables were generally preferred over larger, rectangular ones.

- As in auditoriums, seating needs to be flexible and allow space for wheelchairs to be interspersed into general seating.

- Chairs that are not wheelchairs should glide easily over floors without scraping or rolling.

- Visual aids were uniformly present in special school cafeterias and sometimes utilized in inclusive schools. Picture menus helped students with

Open space increases maneuverability and reduces long lines

limited reading skills to select food independently.

- Posters helped to promote healthy choices.

- Hand sanitizers were placed in easily accessible locations and at a variety of heights.

- In one school, circular or semi-circular sinks allowed groups of students to wash their hands at the same time.

Some teachers recommended multiple smaller, shorter lunch shifts. They reasoned that when students had less time to eat, they stayed more on task. When fewer students were in the space, there was less commotion.

Additionally, features mentioned as beneficial in other spaces are beneficial in cafeterias:

- Contrast between floors and walls and a kick plate around the bottom of walls helps students with vision impairments.

- Changes in level should be avoided.

- Sound dampeners and acoustic tiles will help reduce echoes and the clamor of plates, trays, utensils and boisterous voices.

- Task lighting and lights on dimmer switches can also be used to influence the ambiance of the space. It should be possible, however, to light well and evenly. Lights should not buzz or hum. Indirect lighting can help reduce glare among the hard surfaces of tables, walls and floor.

- Again a floor with some give that can be easily cleaned was preferred. Some teachers recommended "rubberized" flooring.

- If students sit in seating other than their wheelchairs and/or don't use their mobility device when they eat, a convenient "parking space" for the equipment will help keep clutter and obstacles to a minimum.

- Cafeterias need bathrooms close by, so that cafeteria monitors do not have the added duty of monitoring students as they come and go through the corridors.

Plenty of room in food serving area for wheelchairs and maneuverability

About the authors:

Drs. Richard Olsen and Lynn Hutchings began working together at NJIT's Center for Building Knowledge (CBK) in 1991, shortly after Richard Olsen joined the CBK team to lead the Center's health and aging research effort. Their initial research, funded by the Robert Wood Johnson Foundation and the Alzheimer's Association, focused on the needs of people with dementia and their home environments. The team soon became interested in the experiences and needs of people with developmental disabilities and how the built environment could support competence and increase independence and safety for this population. A strong relationship developed between the researchers and the New Jersey Council on Developmental Disabilities (NJDDC). With NJDDC funding, Olsen and Hutchings explored a spectrum of topics related to maximizing person-environment interactions for adults with developmental disabilities moving to and living in community-based residential settings, including group homes, supervised and supported apartments, transitions from institutions to community-based housing, aging with developmental disabilities and the needs of aging parents of adults with disabilities. They also obtained a grant from the Robert Wood Johnson Foundation to explore the needs of families that include a child with physical disabilities. This research resulted in the book and companion video, *A Home for All Children*. Concurrently, the team continued to explore interventions to help people with age-related disabilities. *A Home for Life*, funded by the Administration on Developmental Disabilities, details strategies for making the home environment support aging in place.

Most recently, the researchers have investigated how school facilities can support inclusive education and the education of students with severe disabilities. This manual marks the final project produced by the Olsen/Hutchings team. Dr. Richard Olsen has retired from NJIT, but remains active as an independent consultant. He continues to specialize in improving the fit between the physical setting and the aging, persons with dementia and individuals with physical and intellectual disabilities. Dr. Lynn Hutchings is an Assistant Professor of Social Work at Marywood University in Scranton, Pennsylvania where she continues her research in developmental and physical disabilities, aging and the built environment.

Copies of this and other Olsen/Hutchings publications can be obtained by contacting the Center for Building Knowledge, New Jersey Institute of Technology, Newark, New Jersey 07102-1982, 973-596-3097

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