

The Role of Universal Design in Virtual Deaf Schools "Deaf Space" Case Study

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Abstract:

Deaf people inhabit a rich sensory world where vision and touch are a primary means of spatial awareness and orientation. Many use sign language, a visual-kinetic mode of communication and maintain a strong cultural identity built around these sensibilities and shared life experiences. Our built environment, largely constructed by and for hearing individuals, presents a variety of surprising challenges to which deaf people have responded with a particular way of altering their surroundings to fit their unique ways-of-being. The great development in the use of electronic means and global information network has had an effective impact on the functioning of the teacher and learner in educational fields, became the era of web-based information, which swept through the various fields midday so-called virtual learning or e-learning this study discusses the concept of educational process with multiple inputs and outputs, and how is the crisis of education in all of its institutions through the use of virtual learning and adaptability. The study came to the conclusion that is new style of education can build a virtual environment and virtual deaf space.

Keywords:

*Virtual deaf school design
Deaf Space design
the virtual school
Universal Design*

Paper received 11th May 2016, Accepted 26th June 2016 , Published 1st of July 2016

Introduction

We have combined the initiation of the era of knowledge active movement to recognize the needs of people with special needs of education and rehabilitation to help them carry out a normal life just like the rest of the healthy people even contribute to society effectively serve instead to form a burden on them and their loved ones who are doing their best to be compensated for missed from the senses of hearing or sight, or the ability to move .

And here it highlights the vital role played by technology strategist and planning at the current stage in order to overcome the obstacles and challenges that are part it is not unthinkable or ignore the existence, in the hope the advancement and development of our society and its development.

Despite the interest in the initial stages of the education of the deaf and hard of hearing , but he is lacking the development of this education in the various stages of education and take advantage of interactive learning and virtual education to be compensatory and complementary tool for deaf people .hat introduced modern technology era offering in the field of communications and information systems effective solutions to overcome this handicap , it also provided them

with a greater degree of independence and self-reliance and break the isolation inherent in the disability

Research problem:

- Challenges facing the educational process for people with hearing disabilities of modern curricula and sophisticated traditional methods of education that does not easily allow the presentation of information on the student and understand things, this curriculum of valuable information , but the fraction that is up to him to its own circumstances .
- As the recipient of the deaf that is rarely given an opportunity to participate or interact with others as hearing is the primary way to learn the language and communicate with others

Importance of the research:

- Designing for disabled children and children with special educational needs means putting these children at the very heart of the design and build process, right from inception. This will help ensure not only access and participation but also inspirational school environments.
- Growing interest in people with special needs in developing communities where the prevailing style in the face of disabilities young isolate them and teach them their special education , based on the overcome the deficiencies they have , rather than take

advantage of the facets of excellence in them , which often lead to mental illness underlying difficult overcome.

Aims of the research :

- universal design becomes an important design principle for school architecture. Design requirements for people with disabilities are often the same as for people without disabilities. During the design and construction process, however, requirements can be compromised by economic constraints, aesthetic considerations, and other forces.
- To give people with disabilities skills necessary to adapt to the society around them: Requires skill to learn and acquire Show model of performance, and the exercise of this performance, both of which require the use of means of educational technology.
- benefit from cognitive progress, and facilitate access to information and communication education and civilized new breakthrough brings hope to the hearts of people with special needs "hearing disability" benefit from technology to be rather than what they have lost and find alternative solutions to the process of hearing through the vision visual Knowledge of or convert audio to reading

words check communication between them and all segments of society.

Research Methodology:

In order to study the subject of research and treatment of different dimensions and aspects and clarify the purpose of it was based on the systematic descriptive and analytical , and data and information collection for virtual deaf schools and virtual design and deaf space advantage available from sources and processed scientifically objective to reach the expected results of the search .

Theoretical background

Hearing disability Students with a hearing disability have a number of assistive tools at their disposal. Some assistive technology, such as a hearing aid, is fairly well known and common among those with more serious impairments. However, some tools on the following list may not be as popular, at least to those who either work with or teach students who use them. Let’s see which tech tools are helping make classrooms – and learning environments in general – more accommodating for students with hearing loss.

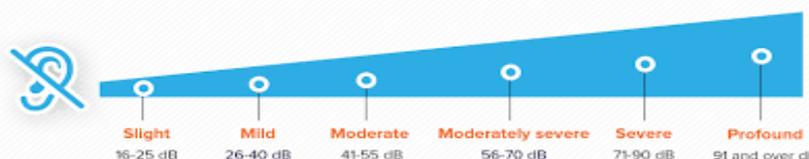


Figure 1 Describe the level of hearing



Figure 2 Hearing Aids

Understanding the Differences: Deaf, Deafness and Hearing Impairment equal, and the level of impairment often dictates just how the person manages both inside and outside of a classroom. The next few sections delineate between the different degrees of hearing loss as well as define the following three commonly used terms: deafness, hearing impairment and deaf.

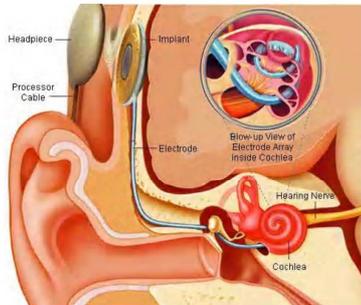
Deafness: Deafness refers to a level of hearing loss severe enough that the individual is limited in her or his ability to process acoustical language, whether they are using assistive listening devices or not.

Hearing impairment :denotes a degree of hearing loss where the individual can hear and understand verbal communication, but only with the help of an assistive listening device or hearing aid.

Deaf :Deaf does not describe the level of hearing problems in an individual. Instead, the term refers

to those who are hard of hearing and use American Sign Language to communicate. For those suffering from hearing loss, the following decibel (dB) values refer to the amount of additional sound energy they would need (relative to someone with normal hearing) in order to perceive a given sound

Tech Tools for Students with Hearing Impairments Hearing Aids :Hearing aids amplify



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http://www.advancebionics.com/com/en/your_journey.html

Figure 3: Cochlear implant inside and outside ear

Cochlear Implants: Cochlear implants are essentially prosthetic ears. They tend to be very expensive, as they require surgery and a great deal of follow up care. As a result, cochlear implants are usually not recommended for those who have anything less than profound hearing loss. Cochlear implants work with external and internal components. The external components consists of a microphone to detect sounds, a speech processor which filters and processes the sounds to be sent to the inner ear and a transmitter which transmits the signal to the internal receiver beneath the individual's skin. The internal components consist of a receiver that receives the processed sound data and converts them into electrical signals, and electrodes that apply the electrical signals to the cochlea. The brain then interprets these electrical signals as sound.

Webcam/Video Chat Technology :Most modern smartphones and laptops are equipped with a webcam or built in video camera and the capability to run software that allows videoconference or video chat capabilities. This allows the possibility of lip-reading (assuming high enough bandwidth and camera resolution) and sign language communication. As long as a student has a smartphone and a data plan, they can take advantage of this technology

.TDD/TYYA TDD (telecommunications device for the deaf) is an electronic device that allows the sending and receiving of text communication over a standard telephone line. Also referred to as a

existing sounds around the wearer. They work by making sounds easier to understand and can provide sound filtering to make existing sounds easier to hear. Hearing aids usually fit around the ear or inside the ear canal. Due to the potential to be overly conscious that someone might notice the hearing aid, college students may prefer the in-the-canal hearing aids, custom-fitted so that they are practically impossible to notice.



Reprinted with permission from Boys Town Hospital (2012)

<http://www.boystownhospital.org/patientservices/pages/cochlearimplantcenter.aspx>

Figure 4: Cochlear implant outside ear

TTY (teletypewriter), a TDD/TYY device consists of a small screen, keyboard and cradle for holding the telephone handset. Text is inputted through the keyboard and presented to the user through the LCD screen.

Though it is considered an outdated device, a TDD/TYY can still be useful in some classroom settings. It can usually be purchased from specialty retailers, such as those found online.

FM System:A frequency modulated (FM) system is a type of assistive listening device that can be used in a classroom or other large area. The speaker wears a microphone, which wirelessly transmits their words to a receiver. This receiver can then be directly connected to a cochlear implant, hearing aid or headphones. Some newer and advanced hearing aids have this FM receiver built in. An FM system can usually be obtained from specialized retailers.

Audio Induction Loop:This technology only works with hearing aids that have a telecoil, so is not available to everyone. It works by taking the sounds picked up by a speaker's microphone and transmitting them through an induction loop, which is usually installed in the floor or ceiling. The induction loop transmits a signal that's picked up by the telecoil in the listener's hearing aid. Some personal audio induction loop systems are available for individual use and may be purchased at specialty retailers.

Full Visual Access : Those who are hard of hearing often rely on visual cues to tell them what is happening in the world around them. Students should be able to see everything around them in the classroom. To that end, desks that are arranged in a "U" shape are more conducive to learning than those arranged to face the front of the room. Teachers should take care to speak only when they are turned toward students, and should provide some visual cues as to what is happening, such as written announcements presented to the student as the same announcements are being played over the intercom .

Distance to Students The default for most teachers is to place students with hearing impairments at the front of the classroom. However, this might negate those students' abilities to lip-read what their peers have to say, as most of those other students are seated behind them. Since the teacher often moves around the classroom when lecturing, the sound direction and volume can vary enough that students have difficulty understanding some or even the majority of the lecture. To alleviate this, attention must be paid to each student's unique needs in order to choose the proper seating distance .

Definition of universal design While the concept of universal design emerged primarily with people with disability in mind, universal design helps everyone with support and assistance needs including the elderly, pregnant women, children and people with a temporary illness or injury. Thus the benefits of implementing universal design are wide.

Applying the seven universal design principles will support practitioners to better meet the needs of as many users as possible. When working in developing countries, it is important to also take into account cultural, economic, engineering, environmental, gender and social contexts.

Seven universal design principles

Principle 1: Equitable use; Design that is useful and marketable to persons with diverse abilities.

Principle 2: Flexibility in use; Design that accommodates a wide range of individual preferences and abilities.

Principle 3: Simple and intuitive use; Design that is easy to understand, regardless of the user's experience, knowledge, language skills, or concentration level.

Principle 4: Perceptible information; Design that communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.

Principle 5: Tolerance for error ;Design that minimises hazards and the adverse consequences of accidental or unintended actions.

Principle 6: Low physical effort ;Design that can be used efficiently and comfortably and with a minimum of fatigue.

Principle 7: Size and space for approach and use ;Design that provides appropriate size and space for approach, reach, manipulation, and use, regardless of the user's body size, posture or mobility

Planning and Design Principles

The following planning and designing principles should be considered when building or renovating school facilities. Provide versatile classroom spaces. Classrooms that provide a variety of choices in the physical environment are preferable for all educational programs but are indispensable for meeting the wide range of educational requirements for students with disabilities and for helping them become successful learners. For example, students with attention deficit disorders and emotional disabilities often require greater physical and acoustical separation between activities to reduce distractions, making single-space classrooms inadequate for their needs. A more appropriate arrangement consists of a large common classroom area, an alcove off the classroom, and a small room adjacent to the classroom that is acoustically isolated but visible from the common classroom area. Varied ceiling heights can further define separations and help control sound from one space into another. An alcove adjacent to a classroom, for example, could have a different ceiling height than the main space. Modular furniture can also provide versatility. Student worktables that can be combined or separated to support a variety of activities such as individual work, small group projects, and full class discussions are particularly useful. Data outlets should be located throughout instructional spaces, not clustered. This arrangement provides maximum flexibility for using instructional technology. Versatility should not be confused

with flexibility, which, while good in concept, often results in generic, single-space classrooms with uniform ceiling heights, lighting, and acoustics. While such inflexible spaces may accommodate many functions, they do not serve any one function well. Versatility, on the other hand, makes a commitment to providing greater variety in the classroom's physical environment and, in practice, provides the most flexibility for both teaching and learning. Likewise, pedestrian walks, bus circulation, car circulation, service deliveries, and parking should be physically separated. The clear delineation of these traffic patterns enhances everyone's safety. Pedestrian routes, including those to and from parking areas and bus loading and drop-off areas, should be well lit during dark hours. Points of transition such as steps, ramps, intersections, and entry doors need special attention as well.

with attractive, accessible school buildings, can empower children and young people with SEN and disabilities. Designing for disabled children and children with special educational needs sets out 'inclusive design principles' which should underpin every project, together with case studies, illustrated examples, plans and photographs showing how they can be put into practice. Inclusive school design goes beyond a one-size-fits-all model, considering all users and removing barriers that might deny anyone – children, staff or visitors – access to services. The design principles define key characteristics that help to achieve inclusive environments, encompassing:

Access – an accessible environment helps children with SEN and disabilities take part in school activities alongside their peers. It's about providing, for instance, a simple, clear layout, accessible circulation routes, and ergonomic design details.

Space – more space may be needed – for children using mobility aids, for instance, for more small group and individual work, and to allow for higher adult: pupil ratios. There may also be extra rooms for personal care and therapy, and more storage space for mobility and communication aids and the wide range of teaching resources.

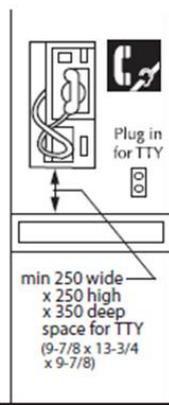
Sensory awareness – the environment can have a significant impact on access. It means thinking about visual contrast, levels of stimuli and the use of colour, light, sound, and texture.

Enhancing learning – a well designed environment enhances a child's educational experience. Good design can help ensure that teachers and children can communicate clearly, that furniture, fittings and equipment support the particular teaching and learning styles, and that specialist resources, personal belongings and mobility equipment are easily accessible.

Flexibility and adaptability – schools must be flexible for everyday use and adaptable over time to meet fluctuating needs. That can involve rationalising spaces so their functions can change over time, using movable partitions, for instance, so that spaces can be configured differently.

Health and well-being – school life needs to be considered from the child's perspective. Thermal comfort, ventilation, accessible personal care, specialist medical and therapy facilities and effective hygiene and infection control can all make a real difference to their health and well-being.

Safety and security – all children should feel safe and secure, supported in their progress to independence. There needs to be zoning to reflect



PUBLIC TELEPHONES

The placement of telephones should address the limited reach of children or persons in a seated position. Longer cords facilitate the use of the phone for someone unable to reach the phone due to a mobility device.

Where an interior public pay telephone is provided, at least one interior public text telephone (TTY) should be provided in the facility in a public use area.

Figure 5
Accessible Telephone for Persons who are Deaf, Deafened, Hard of Hearing,

Department for Children, Schools and Families (DCSF)

:A recent publication from the Department for Children, Schools and Families (DCSF) draws together guidance on designing 'inclusive' school environments. It stresses that there is a wide range of special educational need and no one design solution to support these children. So it's vital that approaches are developed carefully, in close consultation with stakeholders from the word go. Only by talking to teachers, specialists, parents, carers and the children themselves – and incorporating their expertise and experience - can a good quality, detailed brief be developed, which will help turn bricks and mortar into an inspiring, 'inclusive' school environment that matches the needs of the communities it serves.

Inclusive design principles 'Inclusive' design,



different functions, for example, and security that will prevent unauthorised access and exit.

Sustainability – high quality sustainable design is crucial. It can affect social cohesion, ensure value for money and minimise the environmental impact of a school development.

"Designing for disabled children and children with special educational needs" reflects the whole spectrum of approaches, ranging through inclusive mainstream schools and special units, to special schools and co-located mainstream and special schools. Users can draw together the information relevant to their situation locally, combining elements from different sections of the book. It's a useful reference for planning new build or refurbishment, and an invaluable guide for improving or re-modelling existing buildings to bring accommodation up to standard. It can also be used to inform the development of school accessibility plans and disability equality schemes. It's not meant to be prescriptive but instead to offer a starting point towards inclusive environments for all children with SEN and disabilities.

Designing school spaces The central part of the publication focuses on designing specific school spaces, looking at what needs to be included for children with SEN and disabilities – both in learning and social spaces and in support spaces such as group rooms, specialist facilities, staff accommodation, toilets and changing areas, catering areas and storage. Key design points are highlighted, along with charts showing area guidelines. Learning and social spaces are divided by phase of education – early years, primary, secondary and post 16 – looking first at mainstream and then at special school

accommodation. The information in these pages can be put together to suit the age range of any school project. There is detailed technical guidance covering building construction, environmental services, furniture, fittings and equipment and the information and communications technologies (ICT) needed to support children with SEN and disabilities. Example schedules are a useful check for designers, showing how the guidance on individual spaces can be brought together for different sizes and types of school. Schools are a vital community resource. By 2010 all schools (often working in partnerships or clusters) will be providing access to a range of services - childcare in primary schools, parenting support, swift and easy referral to targeted and specialist services, and wider community access to IT, sports and arts facilities, including adult learning. Designing uplifting school spaces that are fully accessible for disabled children and those with SEN is an essential part of this community focus and fundamental to 21st century schools

The concept of Universal Design promises to improve outcomes for all students, including those with disabilities. Some aspects of Universal Design can be implemented at the local level; others will require the cooperation and commitment of manufacturers, publishers, and others. By changing the focus from remediation of individual disabilities to expansion of the usability of classrooms and curricula, benefits will be realized by students, teachers, and schools.

Table 1: Classroom Examples of Universal Design Principles

Principles of Universal Design (Connell et al., 1997)		Classroom Examples
1. Equitable Use	"The design is useful and marketable to people with diverse abilities."	Students of all ability levels are appropriately challenged. Students with disabilities are neither segregated nor stigmatized, and privacy is respected.
2. Flexibility in Use	"The design accommodates a wide range of individual preferences and abilities."	Different learning styles are accommodated. Students can demonstrate knowledge through multiple means. Equipment allows left- or right-handed usage.
3. Simple and Intuitive	"Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level."	Textbooks are available digitally and provide hot links to definitions of difficult words (click on the word and see a definition). Lab equipment has clearly labeled controls, with symbols as well as words.

4. Perceptible Information	"The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities."	Students with sensory impairments can access materials in alternative formats. Texts are available in different formats and media; videos include captioning.
5. Tolerance for error	"The design minimizes hazards and the adverse consequences of accidental or unintended actions."	Students review each others' work and make changes prior to grading. Computer programs offer hints to help students with difficult problems. Lab equipment is designed to minimize breakage.
6. Low physical effort	"The design can be used efficiently and comfortably and with a minimum of fatigue."	Microscopes are connected to computer display screens. Lab equipment is physically easy to operate.
7. Size and space for approach and use	"Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility."	Classroom space is arranged to accommodate assistive devices and personal assistance. All students have a clear line of sight to the teacher and material being displayed.



Figure 6 the newly built Michigan School for the Deaf in Flint

Special Education Services:

Students with hearing disabilities face unique challenges inside the classroom. Many common learning modes that people take for granted — lectures, discussion groups and even one-on-one conversations — can be a struggle for those who have any level of hearing difficulty. However, that doesn't mean a college degree is out of reach. Today's wide range of tools, devices and systems can help students with hearing impairments thrive in an educational setting. This guide focuses on those resources, tech tools and expert tips that students of all ages — and all impairment levels —

can use achieve academic success.



Figure 7 The Sorenson Language and Communication Center- Gallaudet University



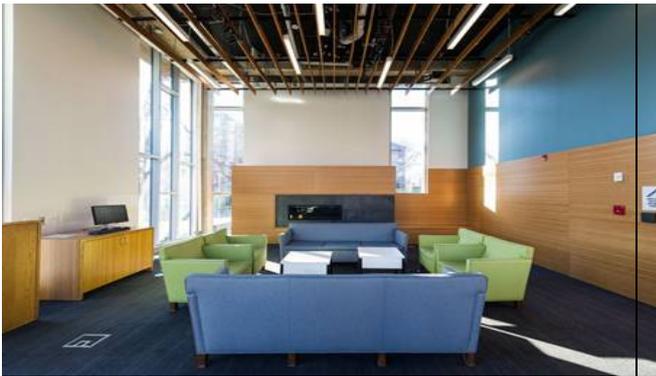


Figure 8 -Groups of signers will naturally sit in circles or arcs-. Gallaudet University

Virtual Schools: A virtual school solution to meet students’ needs across Geography and Socio-Economic Backgrounds We deliver our best-in-class full- time virtual learning model to students through online schools. In their online learning environment, students receive assignments, complete lessons, and obtain instruction from certified teachers with whom they interact online, telephonically, in virtual classroom environments, and face-to-face.

The Virtual School of Architecture and Design

The Virtual School of Architecture and Design – VS – is an innovative 3-D virtual world. The environment was created identifying discrepancies between courses online and the special needs to attend architecture area, in particular creativity and expressive development spaces.



Figure10 Virtual Schools

Many states have embraced virtual schools as a means to provide families with a publicly funded alternative to a traditional classroom - based education. .Many children simply cannot get the individually focused and flexible learning they need in a traditional classroom. Parents and educators who choose K¹² understand the great

potential of an individualized education .Additionally, since parents are not required to pay tuition, virtual public schools make our learning system available to the broadest range of students. The K¹² curriculum and patented methodology for online learning Are ideal for harnessing this powerful approach to learning.

Design of library resource centres;Library resource centres are an important school resource.

They provide a learning space for children during class contact time and non-contact time. They allow children to engage in a quiet and positive learning environment while reading books, usingcomputers and studying in private. Library resource centres need to be designed so they are accessible to children with disability

Cultivating creative spirit

The Architecture and Design environment have been full of innovation. New constructions materials, technologies, whole new civil industries have emerged .Creativity is the historic route to architecture growth. Creativity seems to be useful in any field of life, in arts, science, and business. New ways of thinking that express creative solving of problems is motivated. The pedagogic model of Virtual School is the collaborative learning.

Virtual-Reality World more recent phase of the project extends the software into an immersive, virtual-reality world. Working with Purdues Envision Center for Data Perceptualization, the researchers are creating a game that is projected onto three walls and the floor of a special room, using Fakespace Labs FLEX system. (The VR game can be played on a PC as well but it is not immersive in that format.) When using the application, the child wears a special lightweight stereoscopic glasses, pinch gloves and a wrist tracker. These devices allow the child to communicate with the animation to follow the childs perspective as he or she moves.



Figure11: Telling a history about Odyssey



Figure 12: Build a Medieval Arch

Such a system is an effective teaching tool because it gives the students control over the environment, offers self-paced and repetitive learning, presents concepts in a concrete rather than abstract manner, features an environment that feels safe. All of these characteristics help the student overcome challenges that are common to people with learning disabilities

The game features four stores in which students learn a different math concept: a bakery where they learn about weight, a clock store where they learn to tell time, a toy store where they learn how to count money and a candy store where they learn addition and subtraction. The avatar and the child can communicate; for example, one of the avatars can ask a question and the child can sign a simple answer, such as a number, or the child can pick up a certain number of candies and the avatar can make the sign for that number

Comprehensive Instructional Program

Individualized Learning Plan for Every Student

:An Individualized Learning Plan for each student is designed to outline academic objectives, document strengths and challenges, and to sequence the student's course work for maximum success. For middle and high school students, the ILP expands to include academic objectives, including post-secondary goals for college and/or career. The development of the ILP is a collaborative team process involving all parties—the student, parent, teachers, guidance counselor, and advisor.

Assess Every Objective to Ensure Mastery:

Ongoing assessments are the most effective way to evaluate a student's mastery of a lesson or concept. To facilitate effective assessment, our curriculum establishes clear objectives for each lesson. Throughout a course, each student's progress is assessed at a point when each objective is expected to be mastered, providing direction for appropriate e pacing. These periodic and well –

timed assessments reinforce learning and promote mastery of a topic before a student moves to the next lesson or course.

Facilitate Flexibility as the Level, Pace and Hours Spent on Each Objective Vary by Child :

We believe that each student should be challenged appropriately. Each individual student may take greater or fewer instructional hours and more or less effort than the average student to achieve progress. Our learning system is designed to facilitate this flexibility in order to ensure that the appropriate amount of time and effort is allocated to each lesson.

Employ Technology Appropriately for Learning:

While all of our courses are delivered primarily through an online platform and include a significant amount of online content, we employ technology specifically where we feel it is appropriate and can enhance the learning process. In addition to online content, our curriculum includes a mix of offline course materials, including engaging award-winning textbooks and hands-on materials such as science lab materials. We believe our balanced use of technology and offline materials helps to maximize the effectiveness of our learning system.

Lesson Planning and Scheduling Tools :

In a school year, a typical student will complete between 800 and 1,200 lessons across six or more subject areas. Our lesson planning and scheduling tools enable teachers and parents to establish a master plan for completing these lessons. These tools are designed to dynamically update the lesson plan as a student progresses through each lesson and course, allowing flexibility to increase or decrease the pace at which the student moves through the curriculum while ensuring that the student progresses towards completion in the desired time frame.

Progress Tracking Tools:

Our progress tracking tool allows students, parents and teachers to monitor student progress. In addition, information collected by our progress tracking tool regarding student performance, attendance and other data is transferred to our proprietary management system for use in providing administrative support services.

Assessment Tracking Tool: Independent third-party assessments (such as Scantron and Study

Island tests) are used in most of our managed K12 partner schools to pinpoint specific individual student strengths and weaknesses relative to state content standards at the beginning of the school year. These results enable the teacher to develop a highly personalized individual learning plan for students. End-of-year testing provides a measure of individual student growth demonstrating the value-added gains of the school program

What is Deaf Space?

When deaf people congregate the group customarily works together to rearrange furnishings into a "conversation circle" to allow clear sightlines so everyone can participate in the visual conversation. Gatherings often begin with participants adjusting window shades, lighting and seating to optimize conditions for visual communication that minimize eyestrain. Deaf homeowners often cut new openings in walls, place mirrors and lights in strategic locations to extend their sensory awareness and maintain visual connection between family members. The DeafSpace approach is only starting to reveal its full potential, and the guidelines are a work in progress rather than a set of proven rules. But already, their close focus on human cognition and emotion, and on the mechanics of bodies in space, feels radical in an age of grand architectural form-making. These practical acts of making a DeafSpace are long-held cultural traditions that, while never-before formally recognized, are the basic elements of an architectural expression unique to deaf experiences. The study of DeafSpace offers valuable insights about the interrelationship between the senses, the ways we construct the built environment and cultural identity from which society at large has much to learn

The DeafSpace philosophy rests on five basic principles. The first is space and proximity. Deaf individuals often initiate communication with eye contact and need to maintain it over the course of a conversation. Facial expressions are important in ASL. So are body movements; to be able to sign comfortably, a person needs adequate space—more than is typically required for someone engaged in spoken conversation.

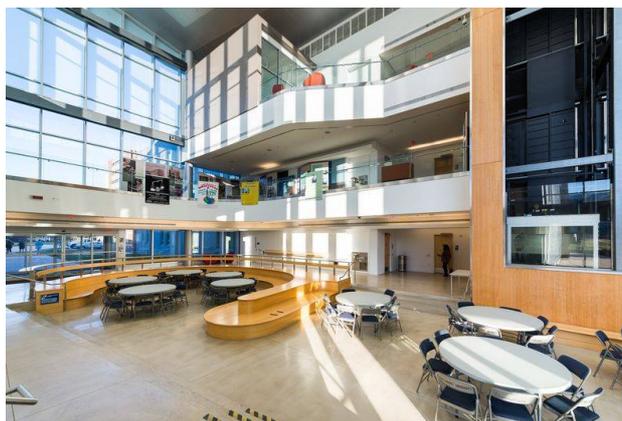


Figure 13 This bench is designed for a group of signers to sit and talk, but it is awkward for small groups.

Groups of signers will naturally form circles or arcs to include everyone. They avoid long, rectangular tables, which impede views. The least Deaf-supportive space Bauman could think of, when I asked him what it might be, was the traditional classroom with straight rows of desks; that layout breaks up lines of communication, except between student and teacher. Many classrooms at Gallaudet have round or horseshoe-shaped seating arrangements. Meeting rooms may have oval desks; lecture halls are raked, and ideally have multiple aisles so an audience member can easily take the stage when he or she wants to ask a question.

DEAFSPACE CONCEPTS

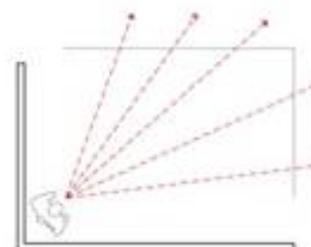


Figure 13 This bench is designed for a group of signers to sit and talk, but it is awkward for small groups.

Sensory reach

Spatial orientation and the awareness of activities within our surroundings are essential to maintaining a sense of well-being. Deaf people "read" the activities in their surroundings that may not be immediately apparent to many hearing people through an acute sensitivity of visual and tactile cues such as the movement of shadows, vibrations, or even the reading of subtle shifts in the expression/position of others around them. Many aspects of the built environment can be

designed to facilitate spatial awareness “in 360 degrees” and facilitate orientation and wayfinding . "Sensory reach ", refers to how Deaf people use their senses to read the environment. The DeafSpace Guidelines recommend various tactics for extending sensory reach, like designing view corridors through and between buildings, and giving them ample glazing inside and out, so entrances and functions are legible. Low-glare reflective surfaces can offer clues to nearby activity (for instance, the shadow of a person just outside one’s range of vision), as can controlled vibrations (the footfalls of someone coming around the corner).

space and proximity

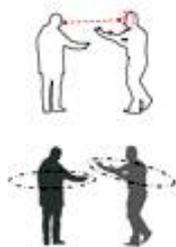


Figure 14 sensory reach

In order to maintain clear visual communication individuals stand at a distance where they can see facial expression and full dimension of the signer’s “signing space”. There space between two signers tends to be greater than that of a spoken conversation. As conversation groups grow in numbers the space between individuals increases to allow visual connection for all parties. This basic dimension of the space between people impacts the basic layout of furnishings and building spaces.

Mobility and proximity

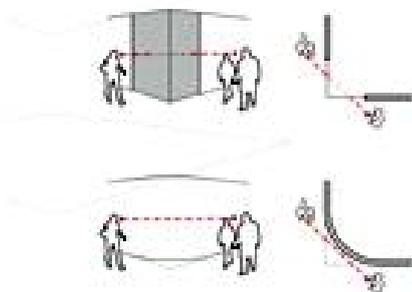


Figure 15 mobility and proximity

While walking together in conversation signers will tend to maintain a wide distance for clear visual communication. The signers will also shift their gaze between the conversation and their surroundings scanning for hazards and maintaining proper direction. If one senses the

slightest hazard they alert their companion, adjust and continue without interruption. The proper design of circulation and gathering spaces enable signers to move through space uninterrupted.

light and color



Figure16: Laboratory of Colour: mixing lights.

Poor lightin conditions such as glare, shadow patterns, backlighting interrupt visual communication and are major contributors to the causes of eye fatigue that can lead to a loss of concentration and even physical exhaustion. Proper Electric lighting and architectural elements used to control daylight can be configured to provide a soft, diffused light “attuned to deaf eyes”. Color can be used to contrast skin tone to highlight sign language and facilitate visual way finding.

The DeafSpace principle is light and color. Certain colors, especially muted blues and greens, contrast well with a variety of skin tones, making them easy on signers’ eyes. Gallaudet does rigorous color-testing on new and refurbished interiors. Lighting should be soft and diffuse, and avoid dimness, backlighting, glare, and abrupt changes

Acoustics

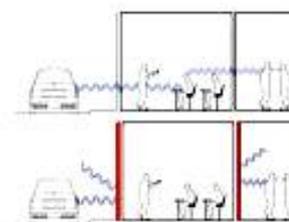


Figure17 Acoustics

Deaf individuals experience many different kinds and degrees of hearing levels. Many use assistive devices such as hearing aids or cochlear implants to enhance sound. No matter the level of hearing, many deaf people do sense sound in a way that can be a major distraction, especially for individuals with assistive hearing devices. Reverberation caused by sound waves reflected by hard building surfaces can be especially distracting, even painful, for individuals using

assistive devices. Spaces should be designed to reduce reverberation and other sources of background noise.

Acoustics :. In general, acoustically quiet spaces are the goal. Hearing aids and cochlear implants amplify sounds, and for their users, the hum of air conditioning or loud echoes can prove extremely distracting.

Virtual deaf school design

There are several things to consider when a person designs a building. The ideas and decisions that need to be made can be difficult for an untrained professional. Even a trained professional can have a hard time designing a building if she is designing for a particular culture she is unfamiliar with. If the designers had a person of that particular culture help with the design decisions not only would the designing be much easier but also more functional and practical for that culture.

There is a huge range of situations that one would need to consider when designing a school building for the deaf. The building could develop into its full potential if the design team collaborates with the deaf community about its functionality. According to Hansel Bauman an architect at HBHM Architects, that is just what Gallaudet University did. Together a design team along with students and staff of the university “[aimed] to create an aesthetic that emerges out of the unique [way] deaf people inhabit the world.”

How Gallaudet University’s Architects Are Redefining Deaf Space

Founded in 1864, Gallaudet is still the only liberal arts institution geared to the Deaf and hard of hearing in the United States—or, for that matter, in any country (a school motto is "There is no other place like this in the world"). It is where the football huddle was invented, players shielding their hand signs from opponents’ eyes. Today, there are about 1,900 students on the Olmsted-designed campus in Northeast Washington, where American Sign Language (ASL) is the preferred mode of communication. Some are profoundly deaf; some have a degree of hearing and may have cochlear implants or use hearing aids.

Hazelwood School:

Hazelwood School was designed specifically for children who are “dual sensory impaired” – they are both blind and deaf .Hazelwood School, Glasgow, by Alan Dunlop Architects Architecture

& Interiors His belief is that architecture is how we frame our perception of place and that design is the conduit through which we convey ideas about materials, colour, light and space. One of his most prominent recent projects is Hazelwood School in Glasgow. This is a school for children and young people, aged 2 to 18, who are blind and deaf – “dual sensory impaired”. Architecturally, it is a new type of project. Many of the school’s children are physically handicapped and all have a degree of cognitive impairment. Together they represent the most acutely disabled children on the City of Glasgow’s education role. They will need lifetime support. He was determined to create a school which would support the needs of the children and the aspirations of their parents, a place of safety and ambition that would free the teacher and inspire the child. building manages to reduce the visual scale of the main circulation areas while diminishing the institutional feel that the classic sole long corridor would create. This also significantly reduces visual confusion by limiting the extents of the space. The materials are of course really important for the final design: they help make it both suitable in the context and exciting to the user. The architects use a palette of highly textured natural materials, stimulating to touch and smell, both extremely important to the end users, the students. On the outside, timber boarding that will weather naturally, slate tiles recycled from older construction sites and zinc were chosen for variety and contrast. Inside, the main corridor wall is clad in cork, which is warm to touch and has tactile qualities while providing signs or messages along the route, thus making it easier for the children to locate themselves within the school. The Figure 8 refers to the relationship between the building and its surroundings. The building itself is not an object placed neutrally in space. On the contrary, plays a complementary role, such that that building and its surrounding area form a unified landscape. With this decision, the natural and artificial components enter into a dialectical relationship, maximising the input of multi-sensory information to the users. In addition to this, it provides a space full of rich surprises and changing spatial experiences, always in close relationship with the natural realm and its elements. This demonstrates the importance of the

natural surroundings and its osmosis with the artificial. The opportunity for discovery and 'ownership' of differing spatial qualities for each individual student is thus multiplied. The second is the provision of a general, intuitive framework for the creation of space, to ensure the orientation of the senses and cognitive impulses. The organization of the building around a main route is not limited to the visible cork wall. More significantly it acts as an arterial ligature of spaces

that always relates to the general directional flows recorded in the cognitive map of the user. The curvature of the system does not change this condition since it is a topological transformation that maintains the relationships between spaces. This simple transformation enriches the spatial experience by using the bends as openings towards natural areas, sometimes introverted, sometimes extroverted. The overall framework is a structure that relates movement to spatial experience

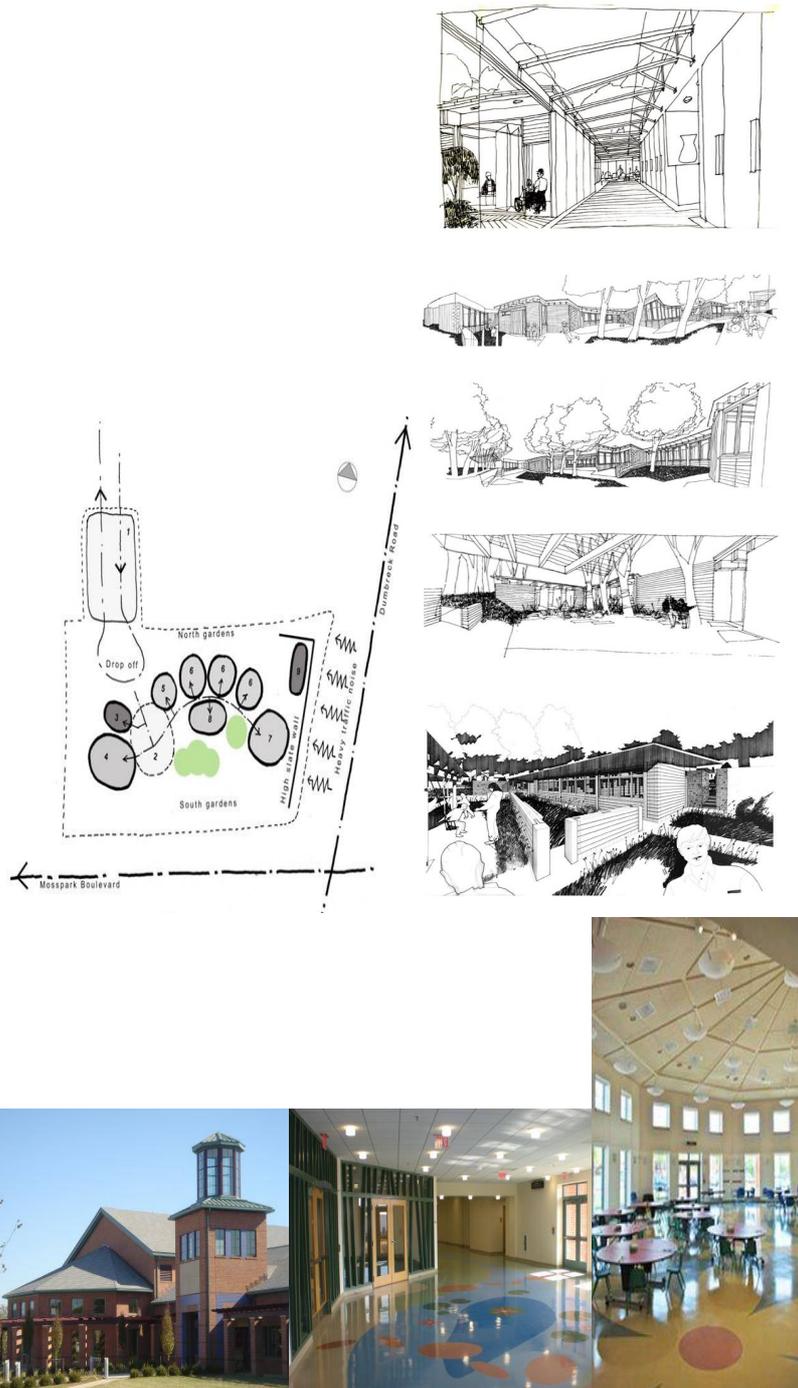


Figure18 Inside the school, the curved floor plan of the Maryland School for the Deaf, New Elementary School

Henry Adams provided the MEP design and | construction phase services for a new three-

building school totaling 76,130 SF. The Elementary School is a new 47,900 SF structure designed to serve Pre-Kindergarten, Kindergarten, and Grades 1-5 with a total capacity of 130 students and 40 staff members. Attached to the school is a new 11,955 SF Student Support Services Building. The third component was a 16,275 SF Family Education & Early Intervention Building.



Figure19 -A school in Scotland for blind and deaf children, a model for collaborative design and .process

Results and Recommendations:

- Schools are an important community resource in other ways. They are places in which community attitudes towards people with disability can be modified and changed
- Making school facilities accessible to children with disability involves a large number of elements which, together, create a child-friendly environment and maximise education performance
- Understanding inclusive education is important for universal design.
- Universal design plays an important role in the infrastructure components of each of these sectors. Accessibility Design Guide set out how universal design measures can be applied to support Development for All.
- Inclusive education has different levels, based largely on the level of support required. Some children attend regular schools and may, on a case-by-case determination, require special education such as one-on-one instruction
- Provide information at locations where people with disability will most likely find it, such as community centres,
- Libraries and schools advocate universal design principles to be reflected in local laws and policies identify and understand a partner country's legislative framework and building standards and codes.
- Ensuring that contractors and consultants consider employing people with disability in

design, construction and administration .

- Establishing collaboration between government representatives, infrastructure designers and Disabled People's Organisations to set the parameters for the proposed design, including on available time and funding
- Lighting and good signage is an important aspect in providing a safe and secure environment, particularly for people with disability.
- Communication within the environment is important. Adequate lighting allows for signage to be read. It is also necessary to enable people who use sign language or visual cues in speech to see their communication partners. Emergency communication systems must have both auditory and visual cues
- choose furnishings of colours that contrast with the floor and surrounding walls for easy manoeuvrability
- design and construct furniture to fit the user and maximise physical comfort
- Use non-reflective and colour contrasting materials
- provide single storey structures with accessible corridors, entries and internal doorways, for ease of access and safety
- reduce heat in buildings by planting trees to keep the ground cooler and provide a cooler breeze into school rooms
- Provide good ventilation in the ceiling space so hot air can escape at the upper level of the roof and cooler air can enter at the lower level.
- Apply a minimum of 30% colour contrast between doors and door frames to improve identification of door space.
- Install large windows, preferably on both sides of a teaching room, for natural light and cross ventilation.

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