The Design of a Courtyard Sensory Garden
at the Indiana School for the Blind

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Abstract

The goal of this project was to develop comprehensive guidelines for designs that enhance the sensory experience for the blind and visually impaired. These guidelines were applied to the design of a courtyard sensory garden at the Indiana School for the Blind in Indianapolis, Indiana. The garden provides students with opportunities for passive recreation and interaction with the environment all while offering the ultimate sensory experience for the blind, visually impaired, and sighted.
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Thank you for answering all my questions, as strange as some of them may have been. You taught me more than any textbook ever could. Most importantly, you taught me that “just because you can’t see the stars doesn’t mean you can’t reach for them.”
I. Introduction

Disabilities have the power to permeate all of our lives in some way. The chance that someone we know (maybe even ourselves) will at some point in his life be disabled in some way, is very high. While it is often a thought we attempt to keep in the back of our minds, it is very much a reality. Any one of us could lose our ability to walk, hear, or see. The Americans with Disabilities Act was a major landmark in demanding accessible landscapes, however, architects, landscape architects, and designers often fall short of the standards established by the ADA or simply use the guidelines as a checklist for a kit of parts. Accessibility should go beyond ensuring wheelchair access or ramps of less than seven percent slope. Accessible design should be more than an afterthought, more than just meeting legal requirements, it should seek to make the environment enjoyable to all persons, regardless of their physical abilities. Designing for the blind and visually impaired is more than planting fragrant flowers, hanging wind chimes, and putting in a flowing fountain. This is a mere kit of parts and only scratches the surface. Designing for the blind and visually impaired involves spatial definition on a non-visual level, and providing an environment for interaction with the landscape on many sensory and psychological levels. Designing spaces that are truly accessible to the blind and visually impaired goes beyond defining a space as a “blind sensory garden”. Every time a designer approaches the conceptual development of the site, he/she should always consider how that site will be experienced by all persons. While this is
difficult, especially when one has all of his/her abilities, it is necessary to produce truly accessible designs.

The guidelines established as a part of this report should be more than memorized. The ideas shared about enhancing the sensory experience should be comprehended completely and considered every time a design is developed. Designing to enhance the experience of every user should be second nature, not just something one does to meet requirements. Once one begins to truly understand the importance of the guidelines and begins to use them in every design, accessible design will become part of intuition and the project goal rather than just a by-product.

Instead of feeling as if accessible design is a constraint that keeps one from designing the truly ultimate landscape of their imagination, one should see it as an opportunity to expand on the ways in which the designer and the user interpret the space. By enhancing the sensory experience for the blind and visually impaired, one is enhancing the sensory experience for all users.
II. Background

My interest in this project first began when I read the January 1995 issue of *Landscape Architecture* magazine. The issue focused on healing gardens and designing spaces for people with limited mobility and sensory perception. I began to ponder how the blind and visually impaired must interpret nature and how we as designers can enhance their experience with the natural world. All too often, we design “pretty” places and concern ourselves with the visual aesthetics of a site, adding fragrant plants or interesting sounds only as an afterthought. Much could be gained, by designers and users alike, if spaces were designed considering the entire realm of the senses. Those of us who are sighted often rely primarily on the visual sense to interpret and experience our surroundings. By relying only on this sense, we are severely narrowing our scope of perception. When we close our eyes, we open our minds to a whole new palette of experiences: the sounds of the music of earth (birds, insects, wind, rain, etc.), the varied smells of the life of earth (soil, plants, water, etc.), the rich textures nature has to offer, and the taste of nature’s fullness (from the fresh air to edible plants). When we design with all this in mind we are enriching the experience with nature for ourselves as well as for the blind and visually impaired.

Through the design of a courtyard garden at the Indiana School for the Blind, I hoped to expand my understanding of what it is like to experience the landscape on a whole other level without sight. When I first began developing this project, I had a vision of this poor blind person whom I should pity because they cannot see the
beauty and color of nature. I also had many misconceptions (as most people do) about what it really feels like to be blind and what it really means. As I began my literature search, I learned that I was so far off base - that I wasn't even on the field. I began to understand what blindness truly is, what it does, and what it means. Through spending time with the children at the school, I feel I have grown as a person which will help me to grow as a designer. I no longer pity these kids, expecting them to be all sad and serious like grown-ups in children's bodies. They're just like I was when I was a kid: boys and girls chasing one another, teasing each other, and playing together. They are bullies and outcasts; athletes and scholars. They have dreams and hopes and goals. They are planning their futures. Most importantly, they are people. When I talk to people about this project, many say "how interesting, how sad that would be to be blind." How wrong. These kids don't want your pity, nor do they need it. What they do need, however, is for the world to be more conscious of their abilities and needs instead of just writing them off. What they need are designers who design with them in mind, not as the exception but as the rule.

This garden was not meant to be a handout or a token, but rather was meant to be an experience for me to understand how I could become a designer who was more conscious of the many ways our natural world could be interpreted so that my future work can reflect that understanding. While my project site was at a blind school, all sites should be designed with these ideas and these users in mind. For the children, this garden will offer them the opportunity to interact with a world that is all too often inaccessible to them.
III. Statement of Problem

While most of what landscape architects and designers create is often approached from a visual standpoint, it is important to understand that those who are visually impaired or blind interpret and experience the landscape in a way that is very different from the way sighted individuals do.

The primary goal of this project was to explore the realm of the senses in order to develop guidelines for designs that enhance the sensory experience for the visually impaired and blind.

These guidelines were applied to a model at the Indiana School for the Blind.

Objectives

1. Study how sensory experiences translate to the visual sense to create guidelines for designing spaces that will provide the ultimate multi-sensory experience while also being attractive to those who can see.

2. Explore the mobility limitations of visually impaired and blind persons.

3. Understand textures, smells, and sounds and how the visually impaired and blind use these senses to interpret the world around them.

4. Study the characteristics of plant material such as growth rate, blooming season, fragrance, texture, etc.

5. Develop an understanding of the seasonal properties of plants in order to establish guidelines that reflect that study.
6. Explore how others with different or no impairments will experience sites created following the guidelines.

7. Develop guidelines for designs that enhance the sensory experience for the visually impaired and blind.

8. Apply the design guidelines to a master plan for a site at the Indiana School for the Blind.

Definitions

**Blind** - having severe or total loss of vision and light perception (Garvey, 1994).

**Disability** - the limitation, restriction, or disadvantage imposed on an individual’s functioning as a result of an impairment (Scholl, 1986).

**Handicap** - results when an individual is placed at an actual or perceived disadvantage (Scholl, 1986).

**Legally blind** - clinical vision measurement of 20/200, meaning an individual who can see no more clearly at 20 feet than at 200 feet (Scholl, 1986).

**Mobility** - the act of moving from place to place (and the method in which that movement is achieved) (Dodson-Burk, 1989).

**Non disabled** - having minor or no mobility problems; also without moderate to severe disabilities in vision, hearing, or development (Garvey, 1994).

**Orientation** - knowing where one is, where one is going, and how to get there (Dodson-Burk, 1989).
Universal design - the process of designing environments that consider the needs of all users - every size, shape, level of ability (Garvey, 1994).

Visually handicapped - term applying to individuals who are either blind or visually impaired.

Visual impairment - having mild to severe visual loss but retaining some residual sight (Garvey, 1994).

Delimitations

1. The study will not provide construction documents or details.
2. Budget constraints will not be considered when developing the master plan.
3. Plant research and recommendations will be limited to plants that are hardy in the Midwest (USDA Hardiness Zones 5 and 6).

Assumptions

1. No comprehensive guidelines exist for application in the Midwest.
2. The primary users of such sites will be persons who are blind or visually impaired, but the guidelines (and design) will also consider aesthetic qualities for others.
3. The model will be applicable to other facilities similar to the Indiana School for the Blind.
IV. Review of the Related Literature

Blindness and Visual Impairment

History

Throughout history, there have been varied attitudes about and reactions to the blind and visually impaired. In primitive and marginal societies blind and other disabled infants were killed (Monbeck, 1973). In tribal societies, handicapped individuals who were unable to provide for the group and defend themselves were considered a liability. In Sparta, Athens, and Rome, the killing of the blind and other 'defecteds' was sanctioned and approved by the government and prominent figures such as Plato, Aristotle, and Seneca. In some other tribes, the blind were removed from their place in the community but were still treated with benevolence and pity (Lowenfeld, 1973).

In Old Testament times the blind often became wards of the church or were beggars. In the late fifteenth century many of the visually handicapped began emancipating themselves and sought education, later becoming prominent mathematicians, poets, engineers, and other professionals (Lowenfeld, 1973). In the late eighteenth and early nineteenth centuries, efforts were made to educate deaf and blind children. The first school for the blind in the United States opened in Boston in 1829 (Coon, 1970).

In the late nineteenth and early twentieth centuries, vocational rehabilitation programs for the blind emerged, and in recent decades blind children have been integrated into standard schools when possible. Many residential blind schools are
still operating across the country offering specialized education, programs for the multi-handicapped and offering a variety of special services and extra-curricular activities (Lowenfeld, 1973).

Figures

"According to the National Association for the Visually Handicapped, there are 800,000 legally blind Americans and 14 million with some degree of visual impairment." (Seligmann, p.77).

Only ten percent of those labeled as blind and twenty percent of school age children labeled as visually handicapped are totally blind. Most of the individuals considered blind do respond to some visual stimulus such as contrasts between light and dark, shadows, and moving objects. Rarely are the blind in total darkness as is often thought (Scholl, 1986).

Myths and Misconceptions About Blindness

"Blindness is generally considered the most severe handicap, and the stereotype of the blind individual is loaded with negative characteristics and connotations, such as helplessness, dependency, incapacity, and unhappiness." (Lowenfeld, 1973, p. 46).

Many myths and misconceptions exist surrounding the blind. One of the most common misconceptions is that blind people live in a world of darkness, plagued by fear and sadness because they desire so much to see. This idea is false in many ways. From a physical standpoint, "dark can only exist by contrast with light" (Monbeck, 1973). On a psychological level, the blind aren’t any more sad and gloomy than the
rest of us and not all of them yearn to see. They have adapted to relying on their other senses to function (Monbeck, 1973).

Another misconception is that the blind can never lead a normal life (Monbeck, 1973). Actually, blind people can do a lot of things and can be self-sufficient. Blind people are not useless or helpless, but patronizing them will make them become that way (Monbeck, 1973).

A final myth surrounding blindness is that it leads to refinement of the remaining senses (Monbeck, 1973). While this is not exactly true, there does exist a concept called sensory efficiency. The lack of sight means a person must rely more on their senses of smell, touch, hearing, and taste to interpret information about their environment (Monbeck, 1973).

**What Blindness Really Is**

“No closing of our eyes will teach us what it is like never to have known what color is, but by closing our eyes we can get some notion of what it is like not to see color. To imagine what our lives would be without any visual imagery is impossible - visual imagery is too inter-woven with our whole way of thinking; but it is not impossible to imagine what it would be like to be left with visual memories only,” (Carroll, p.4).

When thinking about the blind, many people feel pity for them because of the beautiful things they can’t see (art, sunsets, nature, etc.). However, the blind can ‘see’ beauty through their other senses. For example, while a sighted person observing a sunset may only notice the visual qualities, a blind person will experience
it on several other levels. They will feel the warmth of the setting sun on their skin. hear the fading sounds of the day's end. smell the fields and woods around them and sense the tranquility in themselves and others around them (Lowenfeld, 1971).

Many parents of blind children ask how to explain the concept of color to their children. Blind children establish associations of colors based on events they have experienced and what they have heard from others. If they were told at one time, for example, that blood is red, they may associate the color red with the pain they felt when bleeding once or the stickiness of the blood. On the other hand, if a child is told the dress she is wearing is red and that dress is soft and comfortable, she may associate the color with those feelings. Children have been told that grass is green, the sky is blue, and the snow is white, so they may associate green with the cool, moist feel of grass, blue with clear day feelings, and white with wet and cold (Lowenfeld, 1971).

The Remaining Senses

"Stimulation of these [other] senses through exploration in a rich sensory environment is necessary to develop an adequate model of the external world" (Lowenfeld, 1973, p.121).

The Sense of Smell

"Smell can be extremely useful in conveying information about places and things and also about people," (Carroll, 1961). Even sighted individuals can identify people by their smell (perfume, soap, deodorant) and places by their odor (gas stations, libraries, pine forests, leather stores) (Carroll, 1961).
Studies have been conducted that indicate smell has the power to evoke memories. Often with just one whiff of a particular smell, the observer is transported back in time to the place they associate with that smell and the emotions associated with that experience (Levine, 1987). This is true of both the sighted and blind and visually impaired. There may be a specific aftershave or pipe tobacco the observer associates with their grandfather, or a specific floral smell that reminds them of their grandmother’s garden.

The sense of smell plays a particularly important role in how the blind interpret their environment, especially when combined with other senses. A visually handicapped person may detect the odor of fresh bread and interpret that it is coming from a bakery. However, the sense of smell is unable to identify the distance or direction of the source. By using their sense of touch, the observer can detect the cool shade of the overhang and the rise in temperature near the bakery door. All the senses must work together to interpret all the stimuli and understand the world around the observer (Welsh, 1980).

**Touch**

As discussed before, testing on blind and visually impaired and sighted children and adults has concluded the sense of touch in the blind is no keener, it is simply used more efficiently (Carroll, 1961).

“Through haptic sense (touch and body movement) impressions about the environment, the body, and the body in relation to the environment are received,” (Lowenfeld, 1973).
The sense of touch includes the perception of pressure and pain, the perception of warmth and coolness, the tactile discrimination of shape and form, and the use of all body sensibilities together to determine the objects qualities (Carroll, 1961).

The perception of warmth and coolness is often used by the blind and visually impaired as a means of orientation. Patterns of the cool shade against the warmth of the sun can give the observer clues about where he is walking. Cool shade can indicate that the observer is under the trees or between buildings. Warm sun can indicate an open area and the abrupt change between the two can indicate the corner of a building or a break between trees or buildings (Carroll, 1961).

*Stereognosis* is the scientific term for the tactile discrimination of shape and form. When an observer studies the texture, shape, and size of objects through handling them - he can begin to recognize objects by even the most minimal differences in these characteristics (Carroll, 1961).

*Somesthesia* is the term for the use of all the body sensibilities together to determine wetness, dryness, hardness, sharpness, roughness, smoothness, softness, bluntness, slipperiness, bumpiness, and other textural qualities (Carroll, 1961).

With touch, one can determine the intensity of an object - “if the pressure was applied at a point or across a region,” (Welsh, 1980). This helps identify whether the part touching the observer is a surface, edge, or corner (Welsh, 1980).

The roughness or smoothness of an object is perceived as a result of the vibrations (alternations in pressure) they produce. Other clues and information
sources about touch include proprioceptive information and efferent and outflow information. Proprioceptive information is gained by understanding the movement of parts of the body doing the active exploration of objects. Efferent and outflow information does not depend on information from the actual sense of touch but on information about how the observer must open their hand to pick up the object, and in what manner they explored the object (squeezing, rubbing, tapping, etc.) (Welsh, 1980).

**Sound and Hearing**

"Audition...is one of man's most important senses, playing an important role in day-to-day functioning, and making it possible to communicate with others easily and effectively," (Welsh, 1980)

Audition is especially important to the visually handicapped. Hearing is the long distance sense as it "helps...to identify...the distance through space to a reflecting surface or a sound emitting object," (Welsh, 1980).

The visually handicapped can use reflected sound indoors to determine the size of a room and the type of furnishings in it. In the outdoor environment, reflected sound can be used to determine the type of environment. For example, a lot of traffic noise may identify a business area (Welsh, 1980). Clues from sound outdoors can help the visually handicapped determine when it is safe to cross the street. Hearing also helps the observer establish and maintain orientation. Sounds from a playground or sounds of cars stopped behind a crosswalk, for example, aid the observer in
determining their location based on the distance and direction of the source of the sound(s) (Welsh, 1980).

Fine sound discrimination is employed by the observer to recognize the difference between sounds. Again, reflected sound can provide the clues. The reflected sound of footsteps approaching a wall has a different quality than the reflected sound from walls parallel to the line of travel. This difference in sound helps identify corners, hallways, and openings (Welsh, 1980).

Interpretation of sound is not based solely on the biological reaction but also on the observer's past or present experience with those sounds. The observer's perception of the auditory stimuli in his environment is based on the meaning he attaches to various noises and how he classifies the sounds. Sounds are also often associated with a specific environment and with other senses (Welsh, 1980).

**Orientation and Mobility**

*Orientation* is "knowing where one is, where one is going, and how to get there," (Dodson-Burk, 1989, p. 2). Vision is the best way to collect clues to orientation because it provides the most information. Those people who are visually impaired or blind must learn other ways of orientating themselves with their environment. They must learn to use their other senses to interpret clues as to their spatial relationship to other objects in the environment (Dodson-Burk, 1989).

*Mobility* is the act of "moving from place to place," (Dodson-Burk, 1989). Children who are visually handicapped must learn methods of protecting themselves
from injury when moving about. These techniques include holding an arm or large object in front of the body to use as a bumper (Dodson-Burk, 1989).

Orientation and Mobility Training is designed to teach blind and visually impaired youngsters and the newly blind and visually impaired how to get around safely and efficiently (Dodson-Burk, 1989).

An important part of Orientation and Mobility Training is sensory training which teaches the individual how to rely on textures, sounds, and smells to gain information on the surrounding environment (Dodson-Burk, 1989). There are three primary steps in training the remaining senses. The first step is to make the individual aware of what information can be received through the other senses (Carroll, 1961). The second step involves providing someone to supply feedback as the individual begins to exercise these sensory interpretations. The final step involves arousing the awareness of the information types not used before and awareness of the correct interpretation including the awareness of the absence of stimuli (Carroll, 1961).

Orientation and Mobility Training is especially important for infants, young individuals, and the multi-handicapped as it teaches them how to understand and use the sensory stimuli they can experience (Dodson-Burk, 1989). It is important that young blind and visually impaired children are encouraged to use their senses. When they constantly have someone doing things for them (feeding them, dressing them, etc.) they lose out on a great amount of very important tactile interaction with the world around them (Weiss, 1980). Children should be exposed to using their body and understanding how their body works and moves, should be encouraged to move
and explore, and should be shown a variety of objects in their world (Dodson-Burk, 1989). By exposing children to environments that allow them to listen, touch, and smell, they will become more confident in their remaining senses and will learn to move about more easily (Dodson-Burk, 1989).

**Related Projects and Related Issues**

A lot of design techniques can be learned by studying related projects throughout the world. Some design professionals have made efforts to design environments that enhance the sensory experience for all individuals, especially the blind and visually impaired.

David Kamp of Dirtworks in New York City designed a rooftop garden for the Terrence Cardinal Cooke Health Care Center Residential AIDS Unit in Manhattan. The idea for the project started in 1992 when Harry Schaper wanted to develop a tribute to his brother Joel, a San Francisco landscape architect, who died of AIDS. The main objective of the project was to give acutely ill AIDS patients the chance to experience a connection with nature. The 3000 square foot terrace is covered with terra cotta pavers and is designed to stimulate primarily the senses of smell and hearing (touch is painful to some patients and the disease has caused others to lose their sight). Wind chimes and a fountain provide auditory stimulation and pleasure (one set of chimes makes metallic sounds and the other makes deeper, more meditative tones). These sounds combine with the plants' fragrances to give patients clues on their position in the garden. Effort was also taken to include elements such as the butterfly attracting buddleia and a kinetic wind sculpture to arouse the visual
interest of sighted patients and personnel who view the garden from inside the center (McCormick, 1995).

At the North Carolina State University in Raleigh, Professor Robin Moore and his graduate students are making universal design a high priority in their new master plan for the arboretum. Moore said, "we began to realize that this strategy could be enriching for all users, not just the disabled." (Sutro, 1993). The multi-sensory design concept includes a "site and sound experiential pathway" that guides blind visitors with bells and tree placement that casts certain shadow patterns that define the path. It also includes a stream crossing where visitors can go through the shallow water in wheelchairs or on foot. A touch and smell pathway planted with scented vines and chestnut trees (which drop leaves and nuts for touching) and raised planting beds are other elements of the project which is headed by Susan Little, ASLA of Little and Little in Raleigh (Sutro, 1993).

"But our thinking is not to create a separate universal garden. We're trying not to say 'this is for disabled people' but to integrate these ideas into the overall plan," said Little (Sutro, 1993).

The Meldreth School in England is one of the country's eight Spastics Society Schools and is home to 80 residential students aged nine to nineteen who have some degree of physical disability (visual, hearing, or otherwise). The school took an old, large, inaccessible mound on the campus and turned it into and accessible area with a range of sensory stimuli for sound, sight, touch, and smell. The mound is now an area with varied textures and a music platform where students can use mallets to beat on
wooden walls and play other ‘natural musical instruments’. The sound of running water and the dynamic of light versus shade were also incorporated (Ramsden. 1993).

When designing such a project, author Nelson Coon reminds designers that fragrant flowers and herbs are not for every blind person and offers other editorial comments and advice in his book *Gardening for Fragrance: Fragrance and Fragrant Plants for the Home and Garden*. He comments that many groups have tried to build gardens for the benefit of the blind assuming they *all* love flowers and that they need such a handout. He recommends that if such a project is designed it should not be called a “blind garden” and should be built with the co-operation and support of the blind and visually impaired if it is to be successful.

Some of the issues that Coon says should be considered when undertaking such a design are the site (including cost and possible number of visitors), accessibility to unaided disabled visitors, and the understanding that interest in nature is high among young children but diminishes in adolescence if the interest is not continually enhanced. Coon lists several projects across the United States including the Helen Keller Fragrance Garden at Radcliffe College (Cambridge, Massachusetts), The Brooklyn Botanic Garden, Touch and Fragrance Garden (Scottsdale, Arizona).

Other considerations for a fragrance garden (for blind and sighted) include need, financing, location, accessibility (to blind versus sighted, mobile versus wheelchair bound, young versus old), consultation with prospective users, inclusion of sound as well as fragrance, flora and fauna, and proper plant labeling (education is
important). Also important is physical layout, consideration of the special needs of older persons, publicity, and careful planning of the garden’s contents (Coon, 1970).

Among the design guidelines Coon recommends are high beds, fountains or other water features, winding paths, simplified maintenance, and the use of color as well as fragrance (reminding the designer that not all blindness means there is no perception of color). Also important is that the designer take care to avoid the confusion of scents.

Another important yet unfortunate issue is that of vandalism. At the Ohio School for the Blind Sensory Garden in Columbus, Braille signage has been vandalized repeatedly by visiting sighted school children (Confer, Ansley interview, 10/95). Apparently, at most sites (indoor and outdoor) Braille signage (which is costly and difficult to make) is the first to be vandalized (Confer, Garvey interview, 10/95).

**Accessibility**

One of the most important issues in design today is accessibility. The 1990 Americans with Disabilities Act was the first item of legislation to mandate equal access in the private sector as well as the public sector (Garvey, 1994). The act created standards for “addressing discrimination against individuals with disabilities in employment, transportation, telecommunications, public accommodations, and services operated by private agencies,” (Garvey, 1994).

“In August of 1992, the Americans with Disabilities Act Accessibility Guidelines (ADAAG) were issued to replace any pre-existing accessibility
guidelines.” (Garvey, 1994). Unlike traditional design standards, which base design criteria on the “average person”, these guidelines demand universal design standards which base design criteria on the characteristics and needs of all people - all sizes, shapes, and levels of ability (Garvey, 1994).

During a 1994 Landscape Architect’s Forum on Accessibility, the principles of accessible design were discussed. The list established is as follows:

1. Integrate it into the design - don’t just make the accessibility features (ramps, handrails, etc.) afterthoughts.
2. Provide a multi-sensory experience - consider the ways people can feel, see, smell, and hear aspects of the landscape.
3. Be aware of limitations - for example, only 7% of the visually handicapped can read Braille.
4. Don’t segregate the disabled - single entrance for everyone; playgrounds should allow all children to play together.
5. Consider the needs of the temporarily disabled - pregnant women, the injured, people with strollers.
6. In natural areas, make all structural elements accessible - campsites, restrooms, etc.
7. Be flexible and creative
8. Balance access and preservation at historic sites.
9. Respect nature - example: use boulders for edges instead of railings.
10. Design for more than just the client.
(Source: Lecesse, 1993).

There are certain situations that should be avoided when designing environments for the visually impaired. Some things to avoid include wall mounted items, planters or plants with large overhangs, and any other object the base of which is not detectable with typical cane movements (Welsh, 1980). When designing areas for those with low vision, designers should use different materials, colors, or textures to signal edges of steps or terraces. Landings and ramps should also contrast in color or texture with the flat surface. There should also be a contrast in the color of the walk and the surrounding materials (dirt, mulch, etc.). In addition, darker tile or pavement at doorways and intersections helps the visually impaired become better oriented (Welsh, 1980).

Summary

Understanding how the blind and visually impaired experience and interpret the world around them is critical when creating environments that enhance those experiences. Recognizing orientation and mobility methods and limitations, one can design spaces that allow the user to maintain a sense of location and direction within that space. By understanding how the remaining senses are used to gather clues on the environment, one can incorporate sensory stimuli into the space at a level that does not confuse the user. Studying the successes and failures of design precedents can help one develop a space that reflects the work done by others.

Perhaps most important in designing such environments for the blind and visually impaired is a change in mindset. Instead of thinking of blindness as a terrible
disability, one should think of it as an opportunity to experience the world around them, especially nature, from an entirely new perspective without the limitation of over-reliance on sight as the primary sensory receptor.
V. Site/Context

History

After visiting the Institution for the Education of the Blind in Kentucky in 1844, Indianapolis philanthropist James M. Ray presented an exhibit of the school's work to the Indiana legislature. In 1845, the legislature established a two mill tax levy to send blind children from Indiana to Kentucky or Ohio until a school could be built in Indiana. The following year, the state legislature appropriated 5000 dollars to purchase a site for the Indiana School. Students returned to Indiana and were taught in a rented building until the school was completed in 1847 in downtown Indianapolis. The site, at the corner of Pennsylvania and Vermont Streets was home to the school until September 1930, when it was torn down to build the War Memorial (Indiana School for the Blind).

Since 1930, the school has been located on a sixty acre site just north of Broad Ripple in Indianapolis (fig.1, p.47). In early years, the building of the school, dormitories, and maintenance facilities was funded by the legislature through a division of the State Board of Health. Since the 1960s, funds for renovations, new buildings, and improvements have originated primarily with donations from private donors (Indiana School for the Blind).

Currently home to approximately 180 students aged three to twelfth grade, the school serves blind and visually impaired students referred to the school from local education agencies throughout the entire State of Indiana. While there are more than 180 blind and visually impaired school-aged children in the state, some are
mainstreamed into standard schools in their local district. Of the students at the school, only about twenty percent are totally blind while others experience some sort of visual impairment. Some of the students have not yet experienced serious vision loss but have been diagnosed with conditions such as retinitis pigmentosis (commonly known as tunnel vision) and are at the school to learn skills that will help them to function more independently after the blindness is complete. A small number of the students are multi-handicapped (Confer, Garvey interview, 10/95).

At the school, students are taught daily living skills, Braille, and orientation and mobility, in addition to standard school subjects. There are also many extra-curricular activities and athletics available. All the students who live outside Indianapolis live in school dormitories throughout the school year, with visitation to their parents’ homes optional on weekends. Summer sessions are also held at the school for students who are mainstreamed at public schools during the regular term (Confer, Garvey interview, 10/95).
VI. Site Inventory

The design guidelines established as a part of this project were applied to a design for a garden in the girls' quad at the school (fig.2, p.48). The courtyard is surrounded on all four sides by three story brick buildings which have windows that look out into the courtyard. The four buildings are connected on the first floor and by a second floor balcony only. The courtyard has entries from the center of the first floor of each of the four sides. There is no entry into the courtyard without first going through the buildings. Stairs, however, do lead from outdoor campus areas to the balcony on the second floor (fig.3, p.49). The building on the north side of the quad ('I' dormitory) has first floor storage and second and third floor girls' honor residences. On the east side of the courtyard, 'K' dorm houses the Indiana Educational Resource Center (IERC) on the first and second floors and rented rooms on the third floor. IERC is responsible for producing and distributing large print and Braille books at on a state-wide basis. 'H' dormitory, on the west side of the courtyard, houses housekeeping and an AT&T workroom on the first floor and girls' bedrooms on the second and third floors. On the south side of the quad, 'J' dorm holds storage and laundry facilities on the first floor and younger girls' (age thirteen and fourteen) bedrooms on the second and third floors. (fig. 4, p.50-51).

Metal grates (approximately 2.5' square) are located in the northwest, northeast, and southeast corners of the quad. These grates, which are level with the ground plane provide maintenance access to the tunnels below the school and need to be accessible. Two water spigots are located along the east wall. In the center of the
courtyard is a shallow fountain basin level with the ground plane. Currently it is planted with miscellaneous perennials.
VII. Program

Purpose

The purpose of this design project is to create a courtyard garden at the Indiana School for the Blind. The design will seek to offer the ultimate sensory experience for the blind and visually impaired as well as for the sighted. This garden will also serve as a passive recreation space with areas for small group and individual activities such as visiting, studying/reading, and the opportunity for exploring the textures, fragrances, and sounds of the landscape. Opportunities for student gardening will also be integrated into the design and programming of the site.

User

The primary users of the space will be the staff and students at the Indiana School for the Blind. The age of the students using the section of the building adjacent to the courtyard ranges from 14 to 19 years old. The level of visual ability ranges from totally sighted to partially sighted to low vision to totally blind with or without light and color perception. Secondary users of the site include parents and visitors.

User needs

- walks of appropriate size and materials that are safe and are easily distinguished from planting areas; materials will be varied to identify different use and activity areas
- sensory stimuli:
  - fragrances/odors
  - sounds
  - tastes (a minor element)
  - colors
  - light variances
  - visual stimuli
• places for the following activities:
  reading/studying
  relaxing
  visiting with friends
• sizes/types of spaces
  places to be alone
  places to be in small groups (2-4 persons)
  places to be in larger groups (5-10 persons)
  “private” places
    - privacy to the blind and visually impaired usually is a matter of
      shutting out all unwanted auditory stimuli
  open, central spaces
• elements desired (established through student interviews)
  water
  interactive water
  wind chimes or sound sculpture
  places to work with plants
  “touchy” plants
  colorful plantings
  shady and sunny seating areas

Site Needs
• drainage
  prior to installing the design, an engineer should be consulted to determine
  solutions to possible problems with lack of sufficient drainage
• plants
• walks
• places to sit
• focus
VIII. Site Analysis

Please refer to figure 5, page 52.

There are many views into the site from various points around the courtyard. The first floor hallways which surround the courtyard have large windows along the entire perimeter which will allow views and invitations into the garden. The second floor balcony looks over and across the courtyard, while small second and third floor windows provide views from student rooms. There are views out of the site in all directions. These views will be important to the users who still retain a degree of their vision.

The south half of the courtyard and the western third of the courtyard are shaded by the mid-afternoon sun and may be appropriate for shade loving plants and may serve as a cool refuge from the hot sun. The large sunny area opposite this may be appropriate for sun loving plants and for users trying to warm up in the cool seasonal air. There is only a two foot area along the south edge of the courtyard that does not receive some amount of sun during the day.

Drainage is a problem that needs resolution. Currently, underneath the grass in the courtyard, there is gravel from earlier site uses. Water that enters the site through precipitation and irrigation percolates into the gravel rapidly while excess water sometimes drains toward the tunnel grates in the corners. The addition of plant material and paving will greatly alter the drainage patterns. It is suggested that an engineer be consulted prior to construction to resolve any possible drainage problems that new construction might create.
IX. Design Guidelines

Following are guidelines for designs that enhance the sensory experience for the blind and visually impaired. These guidelines should be applied to all designs, not just those for the blind and visually impaired, as they are part of making the environment barrier free.

A. Surfaces/Walks/Signage/Other

1. color contrast with surrounding materials for individuals with low/limited vision
2. textural contrasts for cane users (repelling cane in different ways and making different sounds when tapped)
3. color contrast at doors and intersections to aid those with low vision in orientation
4. texture
   a. needs to be totally level - if pavers or stone, must be well-laid and well maintained to avoid uneven spots and “dips” where tripping could occur
   b. materials
      1. not appropriate, too soft - crushed rock, earth, lawn, river rock, soil cement, bark/mulch, pea gravel, sand
      2. somewhat appropriate, variable - cobblestones, exposed aggregate, flagstone, sand-laid brick, wood deck, wood disks in sand
      3. most appropriate, hard - asphalt, concrete, tile/brick in concrete
      4. use textural differences as warning device (for intersections, etc) only in a controlled environment such as a school for the blind (walk surfaces are not universal and changes may be confusing when not in such an environment)
5. other concerns
   a. crack width not to exceed 1/2 inch (cane tip size)
6. edges
   a. must be well-defined either by curbs or differences in material type and color
   b. walks/edges recommended to be straight, with even curves, and with easily identifiable corners; avoid meandering paths with no reference points
c. corners and edges are used by blind and visually impaired individuals - keep clear of plant overgrowth

7. size of walks
   a. cane tapping distance (varies by users, but typically) 3'-0" lateral reach and 2'-8" forward reach
   b. should be at least 5' to 6' wide to allow two-way wheelchair travel
   c. size ultimately depends on type of use and number of users

8. steps/ramps/level changes
   a. try to avoid, however if included:
      1. clearly define with color contrast between levels, or by edging steps/terraces with bright yellow or white strip
      2. include railings to help with determining start and finish of steps and to aid with balance

9. wall mounted items/seating and planter edges
   a. avoid wall mounted items and planters or plants with large overhangs whose base is not detectable with typical cane movements

10. signage
    a. if incorporated, non-obtrusive yet easily accessible signage should be mounted about 30-36" above ground
    b. print in both large print (18 point black type on white background) and braille

B. Sensory elements
1. basic guidelines
   a. don’t overwhelm the user with sensory stimuli
   b. beware not to “clash” fragrances
   c. use raised beds when users in wheelchairs, elderly, or others with bending difficulties are expected

2. plant materials
   a. see matrix, figure 6, pages 53-64

3. visual elements
   a. use bright/rich colors for those with color perception
      1. colors from most to least visible: yellow, yellow-orange, greenish-yellow and orange, orange red, red, green, blue green, red-violet, blue, blue violet, violet
      2. areas of equal light intensity/color intensity should be separated by contrasting areas of darker or lighter color for greater effect
      3. deep reds project best in full sun while blues, lavenders, and violets look best in the early evening or in light shade
4. fragrance/olfactory stimuli
   a. there are seasonal fragrances in nature
      1. freshly mown grass in summer; the mossy, new smell in
         spring; the smell of wet soil and pavement after a rain;
         burning leaves in fall
      b. fragrances work well when encountered by chance and as a surprise
      c. if fragrance is subtle, place near walk or seating area; if it is strong,
         step it back from these areas

5. texture
   a. understand textures of soil, mulch, hardscapes, bench surfaces, etc.
   b. incorporate water

6. sound
   a. naturally occurring sounds
      1. wind (by itself and through plant foliage)
      2. rain/storms
      3. insects and birds
   b. materials
      1. flowing water
      2. sound sculpture
      3. wind chimes - vary tones in different areas

7. taste
   a. use with extreme caution as edible plants must be clearly marked to
      avoid accidental consumption of inedible or poisonous plants

C. Hazards
1. avoid use of poisonous plants within reach of user (especially if young
   children will be using the space)

2. avoid use of plants near walks and seating areas that deposit excessive
   debris
   a. fruit/nut debris (plants to avoid)
      1. crabapple, plum, cherry, oak, chestnut, hickory, walnut
      2. if fruits or nuts are often quickly eaten by birds or other
         wildlife before they drop, use of these plants is
         acceptable
   b. cone debris (plants to avoid)
      1. pines, spruce, fir, larch, hemlock
   c. seed pods (plants to avoid)
      1. sweetgum, sycamore, honeylocust
   d. branch breakage (plants to avoid)
      1. silver maple, birch, willow, tulip tree, elm, poplar

3. if the area is small and easily accessible to maintenance crews, the use of
   these plants is acceptable as the debris can easily be swept up using the
   seasons it falls from the plants (if seasonal debris)
4. avoid the use of plants with drooping branches that fall within body height clearance, such as:
   a. birch, willow, pin oak, beech, magnolia
5. avoid shallow rooted plants that may trip the user, such as:
   a. beech, willow, red maple, silver maple, cottonwood, poplar
6. avoid plants with unpleasant, nauseating odors
7. avoid plants with thorns and spikes, especially near walks or seating areas
   a. barberry, quince, hawthorn, thorned locusts, roses, privet
8. avoid using plants near seating areas or walks that attract bees or other stinging/biting insects whose bites some users may be allergic to
X. Design Concepts

Concept One: Yin-Yang

The first concept (fig. 7, p.66), or the yin-yang concept featured a circular promenade around the perimeter with arching paths to a central inner promenade. In the center of the courtyard was a water or sculptural feature. There were four semi-private spaces off the central promenade and small, separated private spaces off the outer promenade. It is important to note that for the blind and visually impaired, privacy is often a matter of tuning out unwanted audial stimuli.

Advantages of Concept One
- it was balanced yet contrasts with the symmetry of the courtyard
- it provided many unlinked private spaces
- the promenade on the perimeter offered a different experience from that of the central promenade
- the form was leisurely and flowing without being confusing

Disadvantages of Concept One
- while it is still learnable, it will take some students longer to learn their way about
- when entering the space, users must first walk halfway around the outer promenade before gaining access to center promenade
- there may be too many sub-spaces and it may be difficult to differentiate which space one is in; this can be combated with offering different sensory experiences in each

Concept Two: Symmetry

The second concept, symmetry (fig. 8, p.67), featured two axis through the center of the site and central and outer promenades. There were also four semi-private seating areas off the central space with a central feature and adjoining, smaller, private spaces in the four corners. This concept also introduced the idea of a water trough about 25 to 30 inches high with running water inside.
Advantages of Concept Two
- easy to learn because of the repetition
- the water trough provides orientation through trailing and provides an interactive tactile experience as well as a subtle sound
- site responsive

Disadvantages of Concept Two
- site responsiveness could be considered a disadvantage to some who may feel it was the “obvious” solution
- easy to learn but perhaps because all four corners are the same, differentiation could be difficult; this could be combated by providing different sensory experiences within the familiar spatial layout

Concept Three: Flip-Flop

The third concept, the flip-flop concept (fig. 9, p.68), featured two axis and an outer promenade that traveled a quarter of the way around the courtyard on opposite corners. The concept also featured a central space with a central promenade and central feature. There were four semi-private spaces off the central promenade and small, adjoining private “pockets” within a larger network of spaces at the northeast and southwest corners of the site. On the northwest and southeast corners, turf panels were introduced. This concept also incorporated the water trough.

Advantages of Concept Three
- symmetry exists to an extent so it is easy to learn yet not monotonous
- the smaller pockets of private spaces within a larger space provide variety without the confusion when finding one’s way out of the space as a whole
- the turf areas provide places for outdoor classes to be held as well as the opportunity for users to lie in the grass (which is a sensory experience in itself)
- again, the water trough provides orientation, an interactive, tactile element, and sound

Disadvantages of Concept Three
- the concept is still somewhat symmetrical but that can be combated by offering two different sensory experiences in the corners that are identical
- the concept may be too over-designed as a concept and care must be taken not to over-design or make the garden too intricate

Any of the three concepts would have worked well provided the guidelines were adhered to and materials were carefully chosen.
XI. Master Plan Development

Please refer to figures 10-15, pages 69-75.

Concept three, Flip-Flop, was chosen to be developed into the final design. The guidelines established earlier in the project were used to guide the final design development and the selection of materials. While the northwest and southeast quadrants have identical spatial layouts, as do the northeast and southwest quadrants, the sensory experiences provided in each are different. This layout provides the users with a familiar and ordered environment which allows them to move about easily, enabling them to focus their attention on experiencing the array of sensory stimuli in the garden.

Upon entering the garden from any of the four access points, the user is presented with three choices: to travel straight along the central axis to the central promenade; travel along the outer promenade, or travel into the network of small, private, seating pockets. The user can easily find their way about the site using edges, corners, and sensory clues that differentiate the similar spaces and entrances from one another.

In the northwest and southeast quadrants, the promenade links the north-south and east-west axis. Along the inside edge of the promenade is a thirty inch high marble water trough with a smooth, rounded edge. Users can run their fingers through the running water or along the smooth edge. The running water also provides a soft, soothing sound. Off the promenade is a turf area which is buffered from the building by plant material. On the back edge of the turf area is a marble seating wall.
On either side of the turf are multi-stemmed flowering ornamental trees and shrub and perennial plantings. As mentioned before, while these quadrants have the same spatial layout, the plant material in each differs, expanding the variety of sensory experiences.

The northeast and southwest quadrants offer a variety of seating opportunities. These areas are tucked off the main walk area through the space. This serves to eliminate obstacles in the traffic path and also to provide users a sense of privacy to the users of these spaces. These areas are divided from one another by shrub plantings that further provide a sense of privacy. Much as the ornamental trees in the northwest and southeast corners served to bring the height of the building down to a more human scale, cedar arbors in the northeast and southwest corners serve as a frame on which fragrant white Chinese Wisteria can grow to form an overhead canopy. Again, the plantings in these two quadrants are varied to offer two different sensory experiences.

In the center of the garden, honeylocusts offer light, filtered shade help to provide a contrast between light and dark as well as a different microclimate, both of which help create a different feel than the outer spaces have. The focus of this central space is a fountain that resembles a tree in which the water gently cascades down the leaves creating a soft, trickling sound. The fountain is surrounded by a marble seating wall.

Tucked off the central space are semi-private seating areas which are underneath the trees and screened from the uses behind them by Wardii Yews. These
dense evergreens provide year round screening. These seating areas are also surrounded by shrub and perennial planting beds.

The materials used in the garden adhere to the design guidelines established earlier in the project. The walking surfaces are impressed concrete which offers a smooth, even, hard surface that is available in various colors and patterns. The pattern chosen resembles bluestone, a material commonly used in private, back yard gardens. The use of this material will give a casual, back yard feel to the garden. The same pattern in a sand color was used at the doors as a warning device for the users with low vision. The walk also widens near the door, which serves as a warning device to cane users. The water trough and fountain basin are formed from gray marble and was chosen because it is very smooth and algae is unable to grow on its non-porous surface. Benches are smooth teak, which is not as prone to splinters as other woods. The cedar for the arbor is well-planed and well-sanded to avoid splinters. The fountain is made of thin copper, which will turn a natural green when weathered.

The plants were chosen on the basis of color, texture, fragrance, sound effects, and/or shade quality as well as traditional selection factors such as size, seasonal characteristics, and light requirements. Special care was taken when specifying the plants to ensure a full range of sensory stimuli throughout the seasons. A full list of plants specified supplements the master plan in figure 13, pages 72-73). Figures 16 through 19 (pages 76-79) highlight plants by the sensory quality they were chosen to